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Using school grounds for nature studies : an exploratory study of elementary teachers' experiences

Tamra L. Willis
University of Tennessee

To the Graduate Council:

I am submitting herewith a dissertation written by Tamra L. Willis entitled "Using school grounds for nature studies : an exploratory study of elementary teachers' experiences." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Mary Jane Connelly, Major Professor

We have read this dissertation and recommend its acceptance:

Claudia Melear, Carol Kasworm, Mark Fly

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Using School Grounds for Nature Studies: An Exploratory Study of Elementary Teachers' Experiences

A Thesis Presented for the Doctor of Philosophy Degree

The University of Tennessee, Knoxville

Tamra L. Willis

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Dedication

To Marilyn and Marty for helping me find my voice.

And to Michael for listening.

Acknowledgments

I am very grateful for the support and encouragement I have received from friends and family during my educational pursuit. My husband, Michael Pelton, believed in my ability to accomplish this goal, even when I had doubts. He stood beside me in a supportive role, but also offered constructive suggestions and editing expertise. More than anything, I am grateful for his willingness to accept a dissertation that is neither quantitative nor about bears! My friends and family have also listened to my concerns and ideas, and offered encouragement and support. Thanks especially to Marilyn Nash for reading the transcriptions and to Lynn Cameron for helping me with data searches. I am also grateful for the professional guidance and friendship of Dr. Steven Fairchild and Dr. Charles Watson for igniting my goal to pursue this doctorate. In addition, I would like to thank Dr. Watson for his critical review of the draft.

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Lastly, I would like to thank the participants of this study - ten very dedicated and wonderful elementary teachers who not only gave of their time for the interviews and member checks, but shared much of themselves in the process. They helped make this a rewarding experience for me; I have learned much from them.

Abstract

The purpose of this study was to gain understanding of the experiences of elementary teachers who used school grounds to do nature studies. Following an inductive, naturalistic approach, the goal was to explore the phenomenon using words of teachers as guides to understanding. Interviews were conducted with a purposeful sampling of ten quality public school teachers in grades K-5 who were well-known for their schoolyard nature programs. Interview questions were focused by a theoretical framework of environmental cognition. Data were gathered about how teachers came to use the outdoors to teach and how they experienced teaching nature studies on the school grounds. A conceptual model of Quality Teachers of Schoolyard Nature Studies was delineated. The model consisted of three components: teacher past and present experiences with nature, teacher beliefs relevant to using the school grounds for nature studies, and teacher action efficacy pertaining to schoolyard nature programs. The model suggested a relationship between teachers' personal experiences with nature and their beliefs about sharing nature with children. In addition, the model connected teachers' beliefs about schoolyard nature to their action efficacy, i.e. action behavior reflected through motivation and commitment.

The participants shared many common experiences and beliefs. Most had extensive childhood experiences in nature and memories of adults who shared nature with them. They did not consider themselves nature experts, but felt they knew the basics of natural science from their own experiences outdoors and from working with children. The teachers' beliefs about schoolyard nature studies developed from several dimensions of their lives: experiences with nature, experiences teaching, and experiences with students. They were motivated to share nature with students on the school grounds by their beliefs that students would come to appreciate and understand

nature, just as they had during their own experiences. In addition, they believed that schoolyard nature programs benefitted student learning and enjoyment of learning. The action efficacy of the teachers was influenced by their beliefs about schoolyard nature programs and beliefs in their own competence to overcome challenges and achieve goals. Implications for educational practice and further research were cited.

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THE NATURE OF THE PROBLEM:
INTRODUCTION TO THE STUDY

A child's world is fresh and new and beautiful, full of wonder and excitement. It is our misfortune that for most of us that clear-eyed vision, that true instinct for what is beautiful and awe-inspiring, is dimmed and even lost before we reach adulthood. If I had influence with the good fairy who is supposed to preside over the christening of all children I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength.

If a child is to keep alive his inborn sense of wonder without any such gift from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in.

Rachel Carson
The Sense of Wonder

Introduction

It was a fairly simple activity for fourth graders, but it was the first week of school and most had never done anything like this before. The objectives were to observe and collect data on a small area of the grassy school grounds, a "microhabitat," and then create a field guide using descriptive words. With equipment such as hand lenses, clipboards, and data sheets, the students worked in groups of three or four to collect data. Hoola-hoops were used to mark the microhabitats; a control so that each group investigated the same amount of area. After collecting data, the students worked individually to create field guides with descriptions of their observations such as "yellow-green colored tall grass with three or four little stems with fuzzy things at the top," and "an ant hill with little holes like little doors," and "ants as black as dark-time." The students drew pictures with each description to help further depict what they observed. When the students shared their field guides in

class, they compared and contrasted the different microhabitats of the schoolyard.

With this microhabitat activity, the students in my fourth grade class used the school grounds for an integrated nature study involving science, math, writing, and art. The idea came from a teacher's workshop I attended at some point during my 12 years as an elementary teacher. Since that time, I have noticed that more and more educational materials are encouraging the use of school grounds to teach nature studies. There are numerous books and teacher's guides suggesting ways to integrate tree studies, schoolyard gardening, or sidewalk nature studies into an elementary curriculum, with activity books for rural to urban elementary school programs. Organizations such as the National Wildlife Federation and the National Gardening Association have programs aimed at showing teachers how to develop and use habitats on the school grounds. And the *National Science Education Standards* (National Research Council [NRC], 1996) and the *North American Association for Environmental Education Guidelines for Learning (*North American Association for Environmental Education [NAAEE], 1999) both promote use of the local school environment for nature studies.

Why are teachers being encouraged to use the school grounds for nature studies? One reason is that the outdoors is a stimulating learning environment for students (Bogner, 1998; Crompton & Sellar, 1981) and the richness of the environment and hands-on experiences may "contribute significantly to piquing students' interests and linking their perceptions stored within the brain" (Lowery, 1998, p.27). Taking students outdoors to investigate nature may aid in the development of naturalistic intelligence, described by Howard Gardner (1995) as the ability to recognize flora and fauna and make "other consequential distinctions in the natural world" (p. 206). Also, nature experiences that are integrated into a curriculum and longer in duration than a one day field trip are more likely to increase the

knowledge of students and their attitudes about nature (Leeming, Dwyer, Porter, & Cobern, 1993). Evidence from my own experiences as a fourth grade teacher support the idea that integrated nature studies increase understanding by students of the complexities of the environment and environmental issues.

Another reason may be that many of today's American children live in a world disconnected from nature (Louv, 1990; Nabhan & Trimble, 1994). They spend their days watching television, playing computer games, or going to the mall. When they do go outside, it is to participate in organized sports on a ballfield or splash in a concrete swimming pool or use man-made equipment on a gravel playground. Children have lost contact with those things wild - with climbing trees, playing in a meadow, or picking up rocks in a creek. With the internet at their fingertips, some children today are more connected to the rest of the world than at any other time in history, and yet, they have little personal experience with the very neighbors who sustain them on this planet - the living things around them, the plants and animals of the local ecosystem (Louv; Nabhan & Trimble).

At the same time, there is considerable evidence that children are interested in nature (Nabhan & Trimble, 1994; Rivkin, 1995). Nature related books are some of the best selling on the children's book market. Movies about whales, wolves, and ants all make the headlines on family movie days. More people visit zoos in this country than all of the major professional sports events combined (E.O.Wilson, 1996). These markets insure that children have some knowledge of the animals of this planet - just ask any first grader to name the dinosaurs or to describe an orca whale. But do these markets fulfill a child's desire to find out about nature, or do children need real experiences with the natural world in order to get back in touch with the earth?

The idea that children need outdoor, real experiences in order to have a deeper understanding of nature is supported by the latest reform efforts in science education.

The *National Science Education Standards* encourage an inquiry-based science program where students learn science by "actively engaging in inquiries that are interesting and important to them" (NRC, 1996, p. 13). Inquiry-based science involves asking questions and seeking answers using scientific investigations; it is an important aspect of hands-on, minds-on science lessons. In an inquiry-based classroom, students learn to think and act in ways associated with scientific inquiry, including "asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments" (NRC, p. 105). Teachers engage in inquiry with their students and model the curiosity, openness, and skepticism that characterize science (NRC, p. 37). The *National Science Education Standards* identify the outdoors as a significant environment for inquiry:

> The classroom is a limited environment. The school science program must extend beyond the walls of the school to the resources of the community... the physical environment in and around the school can be used as a living laboratory for the study of natural phenomena. Whether the school is located in a densely populated urban area, a sprawling suburb, a small town, or a rural area, the environment can and should be used as a resource for science study (NRC, p. 45).

Many school system curriculums (including Tennessee and Virginia) are now based on the national standards.

The importance of providing an outside learning environment where children are able to participate in the learning process is not a new idea. Dewey (1899) wrote that personal experience with the environment is the key to understanding and learning about nature:

> No number of object-lessons, got up...for the sake of giving information, can afford even the shadow of a substance for acquaintance with the plants and animals of the farm and garden acquired through actual living among them and caring for them (p. 11).

Soon after Dewey wrote these words, Cornell professor of nature study Anna Botsford Comstock suggested in *Handbook of Nature Study* (1911) that the "object of the nature-study teacher should be to cultivate in the children powers of accurate observation and to build up within them understanding" (p. 1). She argued that teachers must take students outside for these studies in order to cultivate knowledge, imagination, a love of the beautiful, and above all, a sense of "companionship with life out of doors and an abiding love of nature" (Comstock, p. 1).

As Comstock writes, experiences with the environment may increase more than cognitive understanding. Studies suggest that contact with nature can affect environmental concern (Geisler, Martinson, & Wilkening, 1977; Sia, Hungerford, & Tomera, 1985). Experiences with nature may also affect well-being as suggested by the biophilia hypothesis put forth by Kellert and Wilson (1993). E.O. Wilson (1996) defines biophilia as the "innately emotional affiliation of human beings to other living organisms" (p. 165). According to the hypothesis, we are dependent on nature for more than just our physical needs; humans have a biologically based need to associate with their natural environment for "aesthetic, intellectual, cognitive, and even spiritual meaning and satisfaction" (Kellert & Wilson, p. 20). Taken a step further the hypothesis suggests that we are "likely to increase the possibility for achieving individual meaning and personal fulfillment" if we affiliate with life and life-like processes (Kellert & Wilson, p. 21). If the biophilia hypothesis is true, then children who spend time with nature, outdoors, becoming intimately familiar with their surroundings, will have a better understanding of the world and perhaps feel a need to

protect it.

Though it may be desirable for elementary teachers to use the school grounds for teaching nature studies, it is obvious that most do not. The majority of elementary teachers do not even teach science or use hands-on learning, much less teach nature studies on the school grounds (National Center for Improving Science Education, 1989; Weiss, 1993). The schoolyard nature movement is encouraging more teachers to get involved, but only a few studies have been done on the phenomenon. Some of these studies use surveys or questionnaires to focus on the factors or barriers related to using the outdoors for education (Simmons, 1998; Smith, 1994; Young & Simmons, 1992). While these studies are informative, more research is needed to gain understanding of the phenomenon from the perspectives of teachers. By studying the experiences of teachers who are using the schoolyard for nature studies, we may begin to better understand the processes of becoming such a teacher and the efforts required to continue the process.

Purpose of the Study

The purpose of this study was to gain understanding of the experiences of elementary teachers who used the school grounds to do nature studies. Following an inductive, naturalistic approach, the goal was to explore this phenomenon using the words of teachers as guides to understanding. This qualitative study was conducted with a purposeful sampling of ten quality public school teachers (K-5) who were well-known for their schoolyard nature studies programs. The study sought to understand how they came to use the outdoors to teach and how they experienced teaching nature studies on the school grounds. Assumptions of this qualitative study were that meaning was embedded in the lived-experiences of the teacher participants and that understanding their perspectives could add to a better understanding of the

phenomenon (Maxwell, 1996; Merriam, 1998).

Two key research questions guided the study:

1. How do elementary teachers come to use the outdoors to teach nature studies?

2. How do elementary teachers experience teaching nature studies on the school grounds?

Interview questions pertaining to the experiences, perceptions, and motivations of the teachers in natural settings, specifically school grounds, helped focus the study around the theoretical framework of environmental cognition.

Environmental Cognition Framework

Qualitative research is conducted with a philosophical view that "reality is constructed by individuals interacting with their social worlds. Qualitative researchers are interested in understanding the meaning people have constructed, that is, how they make sense of their world and the experiences they have in the world" (Merriam, 1998, p. 6). In an effort to understand the meaning constructed by others, the researcher uses an inductive approach and does not state an hypothesis at the beginning of a study (Maxwell, 1996; Merriam, 1998). Though hypotheses are not tested, they may be generated through data collected during the course of the study. Using an inductive approach, theories may develop from observations and intuitive understandings (Merriam, 1998). The design of the study, therefore, is flexible and emergent and the questions may change as the study advances.

Though a qualitative study is inductive and theory-building, there is still a need to develop a framework of thinking about the research. A theoretical framework serves the purpose of helping to define the research problem, as well as to focus the methodology and analysis of data (Merriam, 1998). Painting the big picture related to the topic is the point of the framework; it is not an attempt to make an hypothesis or

suggest results.

The theoretical framework of this qualitative study is based on the theory of environmental cognition. It is interesting to me that some teachers seem so comfortable using natural settings to teach, while others do not. The environmental cognition of teachers, i.e. their thought processes concerning an environment, may relate to their feelings about natural settings, which in turn may affect their motivation to use the schoolyard for nature studies.

The theory of environmental cognition is based on ideas developed through research by the cognitive psychologist team of Kaplan and Kaplan (1982). Cognitive theories concern the processes of knowing or thinking; they refer to what goes on inside the brain or "mind," i.e., memories, perceptions, insights, thoughts, and feelings. Cognitive psychologists are interested in mental processes such as problem solving, decision making, concept development, memory, and information processing (Lefrancois, 1995). Cognitive theories are the basis for many of the reform efforts in education, including constructivist theory in the field of science education.

Environmental cognition is a theory of the mental processes humans use to experience their environments (Kaplan & Kaplan, 1982). The theory by Kaplan and Kaplan suggests that:

> What people prefer and care about both influences and is influenced by the thought process. People's comfort, their sense of feeling at home, and their confidence in any given setting are all inseparable from their knowledge of that environment and from how readily knowable that environment is (p.x).

According to the theory, when humans experience an environment, it becomes familiar to them. Familiarity means having a cognitive map (or schematic knowledge) of that environment. A cognitive map is based on the physical environment itself and on one's perception of that environment. When humans have a cognitive map, they

not only recognize and understand a familiar environment, but they relate that understanding to other environments yet unseen. In addition, they predict what might happen next in an environment, a process that initiates anticipation and decision making.

The ideas expressed by Kaplan and Kaplan (1982) are presented to explain how people experience their environments and may apply to the teachers in this study (Appendix A). Based on environmental cognition theory, teachers have perceptions (how they recognize things) of natural environments that are intricately connected to their knowledge of those settings. At the same time, the knowledge that teachers have of natural environments is intertwined with their perceptions of the settings. This weaving together of perception and knowledge of a natural place helps create a teacher's familiarity or cognitive map of that place (Kaplan & Kaplan). Central to the construction of a cognitive map is experience with the natural environment (Dewey, 1929; Piaget, 1971; Kaplan & Kaplan). The Kaplans (Kaplan, Kaplan, & Ryan, 1998) write that "the only maps each of us has are the ones that we construct ourselves, and none sprout in an instant. They take not only time to develop, but a great deal of experience" (p. 24).

The environmental cognition of teachers, i.e. their thought processes related to an environment, may affect their motivation for using the school grounds to teach nature studies. Kaplan and Kaplan (1982) suggest that "the intimate tie between what we can do (cognition) and what we want to do (motivation) expresses itself...in the environments we seek and prefer" (p. 71). It makes sense that people seek "conditions that increase their comfort and sense of competence" (Kaplan & Kaplan, p. 74). Teachers who are comfortable with natural settings and feel they have knowledge of the environment may be motivated to take students outside for learning experiences. On the other hand, teachers who are uncomfortable with science and feel they have

little knowledge of the environment may avoid using natural settings with students.

Significance of the Study

This research is an exploratory study designed to better understand the phenomenon of schoolyard nature studies from the perspectives of elementary teachers. Merriam (1998) states that " research focused on discovery, insight, and understanding from the perspectives of those being studied offers the greatest promise of making significant contributions to the knowledge base and practice of education" (p. 1).

Teachers hold a critical role in educational reform. Understanding their perspectives may aid in setting directions for reform efforts (Van Driel, Beijaard, & Verloop, 2001). The latest reform in science and environmental education encourages teachers to use the school grounds for nature studies (NRC, 1996; NAAEE, 1999), but there is little research on the phenomenon from the perspectives of teachers. Research on the experiences of elementary teachers who use the school grounds for nature studies can add to the body of knowledge on the topic of schoolyard learning. In addition, findings from an exploratory study may aid in the design of further research related to schoolyard nature study.

Understanding how teachers come to use the school grounds for nature studies and how they experience taking students outside on the school grounds can aid in the development and maintenance of schoolyard learning programs. Schools need to better understand how to get teachers involved in taking students outdoors for learning about nature. Understanding the experiences of teachers who are using the school grounds may shed light on potential challenges and solutions for such programs.

Chapter Summary

Children need outdoor experiences and teachers are encouraged to take them out to learn about nature (NAAEE, 1999; Sobel, 1996). The school outdoor environment is a good setting for learning (NRC, 1996; NAAEE, 1999). The purpose of this qualitative study is to gain understanding of the experiences of elementary teachers who use the school grounds to do nature studies with their students. The two key questions guiding the study pertain to how elementary teachers come to use the outdoors to teach nature studies and how they experience teaching nature studies on the school grounds. The theoretical framework of environmental cognition is used to focus the study.

CHAPTER TWO

HOW THE INVESTIGATION WAS CONDUCTED:

METHODS AND PROCEDURES

Now I see the secret of the making of the best persons.
It is to grow in the open air, and to eat and sleep with the earth.

Walt Whitman
Leaves of Grass

Introduction

Capturing the perspectives of the participants concerning their use of the school grounds for nature studies was of primary importance in this qualitative study (Denzin & Lincoln, 1994). Following the emic tradition of qualitative research, the goal was to understand the phenomenon from the viewpoint of the participants (C. Kasworm, personal communication, January 10, 2001). The methodology of the study was designed to support this goal, with measures taken to rigorously examine and present the stories and meanings suggested by the teachers.

Multiple Case Study

In this study, a qualitative multiple case study approach was used to gain understanding of the use of school grounds for nature studies by elementary teachers. A case study approach corresponded well with the purposes of this study. Merriam (1988) defined a qualitative case study as "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 21). In studying the use of school grounds by teachers, the focus was on one particular phenomenon of a

school program. Complete (or thick) description of the data was used in an effort to provide insights to the reader's understanding of the phenomenon (Merriam, 1998). Attempts were made to understand the processes that led to the teachers' use of school grounds and the context characteristics of their programs (Sanders, 1981). This multiple case study involved collecting and analyzing data from several cases and then comparing the data using cross-case analysis (Merriam, 1998).

Selection of Participants

The participants of the study were elementary public school teachers, grades K-5, who used their school grounds to teach nature studies. Ten teachers from eight schools in Tennessee and Virginia participated. The participants were selected from referrals by selected science education leaders in Tennessee and Virginia.

The selection of participants involved purposeful sampling. In doing a qualitative study, I wanted to "discover, understand, and gain insight" and therefore selected a sample from which the most could be learned (Merriam, 1998, p. 61). With purposeful sampling, my selection criteria for participants reflected the purpose of the study. I first established the criteria, and then used the criteria as a guide to identify information-rich cases (Merriam, 1998).

There were several criteria for selection of participants, including the one already mentioned; they needed to be public school teachers in grades K-5. Teachers in these grade levels generally teach (or have taught) all subjects and not just one subject as do teachers in middle or high schools. The goal was to find teachers who were not specifically trained as science teachers. Using public schools helped narrow the focus to more "typical" settings, because private schools can bring in additional issues such as religious beliefs of parochial schools or superior funding of wealthy ivy league settings.

Another criteria for my study was that the teachers were well-known for actively using areas around the outside of the school building (school grounds) for the nature studies program. This use of school grounds criteria remained somewhat flexible, as there were several possibilities for using the outside settings. I realized that schoolyard gardening might be the standard for school grounds studies, but did not want to limit my study to gardening. The main criteria was that the areas were close enough to the school that students could use the areas to study nature on a regular basis and they did not have to go on a field trip to get there. I also did not want to specifically define regular use, because I realized that some teachers might go outdoors each week for some kind of study, or they could have a spring and fall unit of nature studies on the school grounds. I decided that if a teacher was well-known by education leaders in the state as someone who takes students outside to do nature studies, she would meet the criteria for amount of time spent outside.

One other criteria was that the participants were quality teachers of their school grounds nature studies programs. For the purposes of this study, a quality teacher was defined by several key characteristics. First, the teachers made efforts to get a school grounds nature studies program started at their schools and were a major force behind keeping it going. The schoolyard program was a focus of their curricula and they worked to get others involved in the school grounds program. In addition, the quality teachers used methods encouraged by the national teaching standards for elementary science and environmental education. These "best-practices" included using inquiry-based, hands-on activities on the school grounds through an integrated curriculum, i.e. more subjects than science were covered.

In order to find teachers who met these criteria, I asked science and environmental education leaders such as State Science Supervisors and Project Wild Coordinators in Tennessee and Virginia to provide names of teachers who were

known in the states for their schoolyard programs. After getting the names of numerous teachers and their school divisions, I contacted the potential participants' school systems to ask permission to contact the teachers, and to do interviews at the schools and take photos of school property. Letters of permission were collected from the school divisions and the teachers were contacted to see if they were interested in participating. During the phone calls, I explained the goals of the study and the teachers briefly discussed their programs. This process seemed to help eliminate those teachers who did not fit the criteria of the study or who simply did not want to participate for a variety of reasons. The selected teachers and I agreed on times for the interviews. They signed consent forms (Appendix B) before we began the interview process.

The Interview Process

Interviews were conducted at the schools at convenient times for the teachers. This was generally after school hours or on teacher workdays when students were not in school, but a few interviews were conducted during the school day when students were out of the classrooms with resource teachers, e.g. music or gym. Most of the interviews occurred in the teachers' classrooms.

In an attempt to shed light on the phenomenon of use of school grounds for nature studies, I conducted semi-structured, open-ended interviews. The interviews included a list of structured questions with possible probes as an interview guide (Appendix C), but also included the use of additional unstructured questions as issues arose during the interviews (Merriam, 1998; Yin, 1994). An attempt was made to maintain a flexible and relaxed atmosphere during the interviews, allowing the participants to freely answer questions and discuss topics. The emphasis was on open-ended questions, allowing information to emerge. I wanted my probe questions

to focus, not limit, the participants' responses. The interviews were recorded on an audio-tape in order to accurately capture the precise words of the participants. Most of the classroom interviews lasted approximately one hour.

The teachers then gave tours of their school grounds. They showed examples of student activities such as plantings and composting, and further explained some of the activities occurring on the school grounds. I took notes and made photographs of these areas, as well as storage and other areas used by the students for their activities. The photos were used as data to support my field observations and the teachers' comments about their school grounds programs.

The experience of interviewing these teachers was extraordinary for me. Their programs were extremely impressive and the teachers' enthusiasm was contagious. In one case, the children returned from gym in time to join us on the school grounds tour. They enthusiastically showed their favorite spots and some of "their" plants coming up in small, individual plots. It was enlightening to see their expressions and hear the excitement in their voices. Certainly, the process of visiting the schools and interviewing the teachers gave a much clearer picture than would surveys or phone interviews. As a classroom teacher myself, I really connected with these teachers and I believe got a better idea of how they operated their programs and what was important to them about taking students outdoors. However, the closeness I felt toward these teachers made it imperative for me to address issues of trustworthiness (validity, reliability, and bias) with care.

Analysis of the Data

Analysis of data began with transcribing the interviews and organizing the data. The interview transcriptions were time consuming and I enlisted the help of a fellow qualitative researcher with transcription experience and an understanding of the

importance of maintaining confidentiality. The complete transcriptions were mailed to the participants for the first member check. With member checks, the teachers were given a chance to review the interview transcriptions to make sure their words, feelings, and thoughts were accurately represented. In addition, the teachers had an opportunity to add information or clarify ideas.

The real challenge of analysis began with the process of developing categories. Each transcript was re-read and divided into tentative categories (within-case analysis). In developing the categories, I tried to keep in mind the purpose of the study, my own orientation and knowledge, and the "meanings made explicit by the participants themselves" (Merriam, 1998, p. 179). After marking and dividing the tentative categories for each case into sections, I printed them out for further study. In order to deal with the overwhelming amount of data, I actually cut-out each section (with scissors, not the computer) and put them into piles. This proved quite helpful, as the mental exercise of developing categories between cases (cross-case analysis) required much moving and changing of sections. My goal was to make the categories exhaustive enough to include all relevant data and mutually exclusive so that a particular piece of data did not fit into more than one category (Merriam, 1998). I worked back and forth between the categories and the data to verify "the meaningfulness and accuracy of the categories and the placement of data in categories" (Patton, 1990, p. 403). In addition to my analysis, a colleague in environmental education read four of the interviews and also made notes of potential categories for each interview.

The findings of the study emerged from writing about the data. Using an inductive approach, with the purpose of the study and the categories as my guide, I began to write. The act of writing itself became part of the analysis (Merriam, 1998). At first I fought this process, attempting to "plan ahead" with what I was writing. But

the combination of thinking while writing led to seeing new ideas or revising the outline when certain sections did not make sense (Merriam, 1998, p. 225). After writing-up a draft of the findings, the teachers participated in a second member-check.

Validity, Reliability, and Bias

Patton (1990) wrote: "The credibility of qualitative inquiry is especially dependent on the credibility of the researcher because the researcher is the instrument of data collection and the center of the analysis process" (p.461). With that in mind, efforts were taken to address the validity and reliability of the research. For this qualitative study, validity had to do with the commonsense correctness or credibility of descriptions, conclusions, explanations, and interpretations (Maxwell, 1996, p.87). Reliability referred to the dependability of the results, i.e. that the results were consistent with the data collected (Merriam, 1998).

For this qualitative study, it was important to accurately record and interpret the perspectives of participants. I audio-recorded the interviews with participants and the words of the teachers were transcribed verbatim. The same questions guided the interviews with all of the participants. Notes were written and photographs were taken of the school grounds where the educational activities with children occurred. Some of the teachers gave copies of classroom newsletters or field guides showing the work of students. One teacher referred to the school website with all kinds of information about the school grounds program. All of these sources were used to triangulate the data, i.e. data from numerous sources were collected and compared to support the internal validity and reliability of my research. In addition, all of the participants conducted member checks by reviewing and commenting on their transcribed interviews. Member checks were used to enhance the internal validity of the study (Merriam, 1998).

During analysis of data, I used the theoretical framework of the study and the words of the teachers to focus my work. Categories were supported with selections of data. An effort at intercoder reliability was made by asking a colleague to read over four of the interviews and then incorporating her comments into my development of the categories. The words of the participants were used as evidence that the interpretations were based on their perceptions of the phenomenon. In addition, the teachers participated in a second member check by reading a draft of the analysis of data to verify plausibility of the results. All eight of the teachers who contacted me agreed that the information was an accurate portrayal of them and their programs. Several gave a few suggestions, which I incorporated into the write-ups. I took this step to verify that I was speaking through them, and not simply presenting my own beliefs about the phenomenon.

The issue of bias presented the greatest challenge to the credibility of this research. As a classroom teacher who used the school grounds myself, I had to constantly be aware of my own story as part of this research. I attempted to maintain a high standard of ethics and efforts were made to analyze my bias at each stage of the research process. In addition, I wrote a narrative of my own experiences to make myself and others aware of my potential biases (Appendix D).

Participant Backgrounds

During the interviews and member checks, professional and personal information was gathered about each participant and her/his school. The goal was to present a verbal picture of the participants and the schools to aid the reader in better understanding their perspectives and experiences. Names of teachers and schools were changed for this report. Appendix E shows a chart of the teacher descriptions.

Ann

Ann taught at a rural school on the outskirts of a small college town. She was a self-contained classroom elementary teacher for most of her 21 year career, but at the time of the interview was a science resource teacher for grades 1-4. Ann had her master's degree in Education and though she had thought of leaving elementary teaching for other opportunities such as administration, she felt that the classroom was where she could make a difference.

When Ann was in high school, she enjoyed science. Her biology and chemistry teachers supported her interest in science, but the school guidance counselor encouraged her to go into education or art instead. She felt the advisor did her a disservice and if she had it to do over again would go into science as a career. She got back into science when she took a workshop as an elective called Bringing Science into the Elementary Schools. The workshop brought together faculty members from a college and elementary teachers to design kits for elementary school science. Though Ann had always done science with her students, this experience "just led into so many other things." She became involved in the Schoolyard Ecology for Elementary Teacher (SYEFEST) program, sponsored by the Ecological Society of America. Ann worked with two members of the Society, science professors from the college in her town. Together they conducted workshops encouraging other teachers to utilize the school grounds for nature studies.

Ann's school, Chestnut Elementary, had approximately 270 students in grades K-5. Only 5% of the students were minorities, and most of the children came from families with farming backgrounds. About 45% of the student population were on free or reduced lunch. Chestnut Elementary sat on a large open grassy field with a stand of woods in the back. Pastures covered most of the area around the school. Ann's schoolyard program did not include a formal garden area, but she used the natural

wooded area and forest edge behind the school for science investigations. It took about two years for Ann to establish her program. During the interview, Ann spoke of concern over the state standards and the impact of high-stakes testing. She felt her program of inquiry had changed because she was under so much pressure to cover the "facts" needed for children to pass the state tests. This conflicted some with Ann's beliefs, as she stated "there are no simple answers when you're talking about nature."

Betty

Dogwood Elementary School was located on the edge of a small city. There were 551 students at the school, with 14% qualifying for free or reduced lunches. About 10% of the students at Dogwood were minorities. On the day of our interview, Betty, a second grade teacher, was just ending her 28th year of teaching and preparing for retirement. During her career, she taught from 1st through 7th grades. She stated that one reason for taking retirement at this time was that she did not want to deal with the state standards. She felt they took too much time and flexibility away from her program.

Betty said she had always been a curious person, and always had an interest in nature. She began working with children at an early age and felt that nature studies and kids just went together. She stated, "I don't know how you can be with a child where nature doesn't come into the picture somewhere." Betty liked to see children affected by their nature experiences, especially those children who did not tend to excel at other school work or sports. She felt nature could be an esteem booster and also taught kids to work together. She found it easier to address the different needs of her second graders when they were outdoors doing nature studies.

It took Betty about 2 years to really get the schoolyard program going. She believed the school grounds were part of an old farm and there was still some open

space around the school. Gas stations and restaurants served as the school's backdrop. The school grounds were designed with gardens, an area for "messy" art projects, and a guidance tree where children could go to relax or just get away from problems. The garden areas included newly planted trees, flower and vegetable gardens, blueberries, and a grape arbor. Vegetables planted by the children included beans, watermelons, and pumpkins which they harvested at the beginning of the school year. Betty was not sure what would happen to her schoolyard project after she retired.

Bob

Bob taught at Carson Magnet School in a large metropolitan city. The elementary school was a double magnet school for both environmental education and a gifted and talented program. The school had 400 students in grades K-5, with 40% of the students minorities. Thirty-six percent of the students qualified for free or reduced lunches. The school was located in an affluent suburban area near a city park, but because of the magnet status of the school, the children represented a very wide range of socioeconomic levels. The student body also represented a number of nationalities, as there was an immigrant apartment complex not far from the school.

Bob had been teaching school (grades 3-6) for 29 years. At Carson Magnet he coordinated the gifted and talented magnet school (about 70 students) and taught third, fourth, and fifth grades in the program with a team of two other teachers. The program was age-specific for language, reading, and math, but science and social studies were multi-graded, i.e. the students were not separated by grades. The two magnet programs were integrated, so much of the focus of the school was on environmental education. Bob stated that "environmental education is a perfect complement to gifted education because it allows children to get out in the real world

and solve problems, so we've had no trouble meshing the two programs." The school was set up on a three-year cycle of themes - land, air, earth - and all teachers emphasized the theme of the year in the curriculum.

The school grounds program at Carson Magnet was expansive. It took about three years to establish the program, including designing the curriculum. The school was surrounded by a large open meadow. The schoolyard included a greenhouse, outdoor amphitheater, two ponds, and gardens designed to attract birds. One of the ponds was located in the wildlife habitat area, and another larger pond was used for aquatic studies. Experiments on water quality and animal life in the pond were a regular part of the curriculum. The greenhouse was also used regularly, as every classroom was required to do at least one plant investigation or long-term growth experiment every nine weeks. In addition to the school grounds, the students also did nature studies in the wooded city park and at a lake, both within walking distance of the school. The school's curriculum was so outdoor focused that one of their biggest problems came with extreme weather conditions when it was prohibitive to take students outside.

Linda and John

John and Linda both taught at Roseville Elementary School (K-7) in a small town centered in a rural area. The student population was 725, with 8% minority children. Forty-five percent of the students participated in the free or reduced lunch program. John taught 4th grade and Linda taught 3rd grade at the school. Together they covered a wide range of experiences, John with a total of 13 years of experience in 4th, 6th, and 7th (science) and Linda with 15 years of experience in grades 2-3. John earned his Master's degree in education, completing an action research project on the school grounds program.

John and Linda started the school grounds program and stated that it took about 10 months to complete the first phase of the garden space. They got the high school woodshop students to build a privacy fence around the courtyard opening of the school. Then parents, students, and teachers got together to put in flower/vegetable beds in the courtyard area. With the help of parents and businesses in the community, an arbor and pond came next. Several of the schools' doors opened into the courtyard and a good number of classrooms had views of the area. Bird feeders were set up outside the classroom windows, and fish swam in the pond. With wildlife habitat as the focus, bird baths and bird houses were also included. Students were responsible for keeping the feeders full, and they collected soda cans to help buy bird seed and additional wildlife attractor plants. The area was full of flowers and vegetable plots. The students had planted 250 bulbs and other flowers including sunflowers.

John did not spend much time in natural settings as a child. As a young adult, John lived in Hawaii and he stated it was "kind of hard not to be into plants when you live in Hawaii." He planted a garden and became very involved in the process of gardening. He later shared nature with his students and was an avid outdoor enthusiast.

Linda said she would rather be outside than inside, so she could "feel empathy for kids when they're looking out the window rather than at the desk." Both she and John took students out to the courtyard to do science experiments or to just have lunch. Linda stated that students "may have had lots of different experiences with nature, so they have all different sorts of background information. As a teacher, you can help them make connections to how those individual experiences fit into the whole of nature's web."

Marilyn and Susan

Marilyn and Susan co-taught kindergarten at Cedar Elementary School in a small city close to the mountains. Cedar Elementary was a year-round school for kindergarten through fourth grades, with a total of 350 students in the school. The students at Cedar Elementary came from fairly affluent socioeconomic backgrounds, with only 8% participating in the free/reduced lunch program. In addition, only 1% of the student body were minorities. Marilyn and Susan team taught the kindergartners in what was once a high school multi-level music room. The school had a philosophy that encouraged the schoolyard program. There were no textbooks and teachers created their own curriculums. They were encouraged to find "whatever books and literature and materials and manipulatives and real objects" they needed to make the program engaging and meaningful to the students.

Susan had been teaching for 28 years, covering grades preschool to third grade. She was raised on a farm and enjoyed gardening, especially flowers. When her own children were young, she enjoyed sharing nature with them and working with them in the garden. When she came back to teaching from raising her own children, she knew she wanted to garden with the children at school. Susan had several favorite sayings, though she did not know who wrote them. One was "all too often we are giving young people cut flowers when we should be teaching them to grow their own plants." Another favorite saying was "think what you would attempt to do if you knew you could not fail." She stated: "We've got to let these children make mistakes, but not see it as failure. We *learn* from our mistakes, so let's give them an opportunity to make those mistakes, learn from that so that they don't see that as a failure."

Marilyn was also raised on a farm, but because it was a racehorse farm, she had little experience with gardening before meeting Susan. She did spend time camping as a child. Marilyn had been teaching school for 6 years, grades kindergarten

through first. Her teaching style was greatly influenced by the work of Susan Kovalik (1994) on integrated thematic instruction. Marilyn stated that "everything we study has to be something the children can experience with as many of their senses as possible." She based many of her comments on research, suggesting that students remembered more if they could "touch and feel and see and taste and experience these real live objects...." She wanted the children's learning experiences to be engaging. Marilyn said the learning environment should be non-threatening, where "truth, trust, active listening, and mutual respect are prevalent." She believed that nature helped "create a welcoming environment" for the students.

Susan and Marilyn had certainly created a welcoming environment on the school grounds. They had been working on it for about four years. From their classroom, a door opened to an outside deck and garden surrounded by a picket fence. The garden areas to the side of the deck and fence were designed to attract ladybugs and butterflies, with water available in a pool. Bird feeders were set up for winter feeding station studies. The rest of the area included L-shaped beds with small garden plots (18 inches square) for each child. There the children planted flowers and vegetables of their choice. One of the highlights of the garden, according to the children, was a secret area under some overgrown cedar trees just beyond the fence. The picket fence lifted to create a hidden door to a tunnel of green growth, just tall enough for little ones to enter.

Patsy

Patsy taught fourth grade at Elm Park Elementary in a quiet neighborhood of a large city. The school had 460 children in grades K-5, with minorities making up 8% of the student body. About 34% of the students at Elm Park were on free or reduced lunches. The school was situated on a tree-lined street beside a small municipal park.

The schoolyard extended somewhat into the park, as the school had developed a nature trail around the area.

Evidence of gardening and nature study surrounded the school, from compost bins outside the cafeteria door, to flower beds along the front and side, and garden plots in back. There was a storage building housing child-sized garden tools and supplies. Patsy's square foot garden beds for her fourth grade class were located just outside her window, with an area for each child to plant and tend to vegetables. Some of the other teachers were involved as well, as a kindergarten garden showed clear signs of attention.

Patsy had been teaching for 30 years, covering every grade from third to eighth. She and a parent volunteer started the school grounds program, which took about three to five years to establish. Patsy credited the parent with much of what they had accomplished at her school, but it was clear that Patsy had put much effort into the program. She stated that she had always been the kind of teacher who, "if a kid brings a bug in, you know, some of the other teachers run and I say 'wait! Let's get the magnifying glass!'"

Paul

Cherry Hill was an inner city elementary school, grades K-5, located in an economically disadvantaged neighborhood of a large metropolitan city. The school had approximately 325 students; 70% were minorities. Over 99% of the students were on free or reduced lunches, with 90% of the children living in project housing. The school had outside emergency drills so that children on the playground knew to fall to the ground in case of a drive-by shooting.

Paul had been teaching elementary school for ten years, grades second, third, and fifth. His third grade class at Cherry Hill participated in designing and making the

nature trail and garden area. The nature trail consisted of a 300 foot long mulched path around the gardens with newly planted trees and other plants lining the path. It went along the street beside the school and included benches and labeled plant names. There were both flower and vegetable garden areas, with compost bins for soil development beside the garden. The gardens were not cared for in summer as in some other schools; it was difficult to get parental help at Cherry Hill as most children (84%) were from single parent homes.

Paul said that the school grounds program began with vegetable gardens one year, then he and the students added the nature trail. They continued to fill in the gaps with an orchard, perennial beds, and an automatic sprinkler system. It took about three years to establish. One of Paul's goals with the schoolyard program was to create excitement towards learning, and he seemed pleased that the students' state test scores had also gone up since starting the program.

Rachel

Rachel taught fifth grade at Evergreen Elementary School, a school of approximately 400 students in grades 3-5. The school was located near a university in an area in transition from rural to small town. Many of the parents worked as service workers at local businesses or the university, or as workers in industry. About 43% of the students received free or reduced lunches and 6% of the student body were minorities. Rachel had been teaching in the county for 19 years, and had taught almost every grade in her K-8 certification. She had a master's degree in education, with a focus on learning disabilities.

The schoolyard nature study area included a large fenced vegetable garden, flower gardens designed for wildlife habitat, and a pond habitat. Over 300 perennials were planted in the flower gardens. Plans were underway to complete a nature trail

and plant an orchard to attract more wildlife. The students collected data related to wildlife on the school grounds, used technology such as GPS units and computers to help with calculations, and sometimes submitted the data to the state game department. Rachel believed the program helped her cover the state standards and found that her students did well on ecology questions on the state tests.

In addition to using the school grounds with her fifth graders during school, Rachel also had a wildlife club for the third, fourth, and fifth graders. There were about 80 members of the club, and Rachel worked with a few other teachers and college student volunteers to do nature studies on the school grounds with the children. The club met before school on Tuesdays from 7:30am- 9:00 am and sometimes on Saturdays. The wildlife club also supplied backpacks full of wildlife monitoring equipment for members to checkout for data collection activities with their parents. Rachel established the club in hopes of encouraging all children to participate in the schoolyard program. She was particularly interested in providing a program that appealed to both genders and in making technology a part of the nature studies activities.

Summary of Participant Backgrounds

Though the teachers in this study taught in a wide variety of schools with varying outdoor settings, the school grounds nature programs were a major focus for each of them. Each teacher was instrumental in getting the schoolyard program started either for their own classroom or the entire school. Their stories suggest efforts well beyond the typical scope of elementary classroom teaching.

Chapter Summary

The purpose of this study was to gain insight into the perspectives of

elementary teachers who use their school grounds for nature studies. Purposeful sampling was used to select ten quality public school elementary teachers who were well-known for their schoolyard nature programs. Interviews were conducted and data were analyzed using the process of cross-case analysis. Efforts were made to increase the validity of the study and to reduce bias. Accurately portraying the teachers and their stories was a major goal of these efforts.

CHAPTER THREE

QUALITY TEACHERS OF SCHOOLYARD NATURE STUDIES: REPORT OF THE FINDINGS

Every child should have mud pies, grasshoppers, water-bugs, tadpoles, frogs, and mud-turtles, elderberries, wild strawberries, acorns, chestnuts, trees to climb, brooks to wade in, water-lilies, woodchucks, bats, bees, butterflies, various animals to pet, hayfields, pine-cones, rocks to roll, sand, snakes, huckleberries and hornets; and any child who has been deprived of these has been deprived of the best of his education.

Luther Burbank
The Training of the Human Plant

Introduction

The purpose of this study was to examine the experiences of elementary teachers who used their school grounds for nature studies. The research focus was to gain understanding of how the participants came to use the schoolyard and what it was like for them. During the interviews, the teachers shared stories of their outdoor experiences and beliefs about learning and nature. Analysis of the data revealed common themes and the development of categories linked these themes together in a meaningful way (Merriam, 1998). A conceptual model of Quality Teachers of Schoolyard Nature Studies was derived from this process.

This chapter of the dissertation will present the findings of this study organized through the conceptual model of Quality Teachers of Schoolyard Nature Studies. The chapter will begin with a description of the conceptual model. The chapter will continue with a presentation of the major findings supported by detailed (thick) descriptions of the teachers' voices.

Quality Teachers of Schoolyard Nature Studies

Educational reform has presented numerous descriptions of elementary teachers who perform exceptional work with their students. For example, the *National Science Education Standards* (NRC, 1996) and the *Guidelines for the Initial Preparation of Environmental Educators* (NAAEE, 2000) both suggest models of effective programs and the best practices of teachers who direct them. These standards are criteria for judging quality, such as the quality of science programs and science teaching, as well as the quality of the system that supports the teachers (NRC). Quality teaching is presented as the heart of effective science and environmental education. The standards use words such as excellent, effective, exemplary, and skilled in describing and defining quality teaching.

Quality teaching of science involves creating an environment where teachers and students work together as active learners (NRC, 1996, p. 28). Quality teachers of science are facilitators; they "guide, focus, challenge, and encourage student learning" through an inquiry-based program (NRC, p. 33). They "design and manage learning environments that provide students with the time, space, and resources needed for learning science" (NRC, p. 43). As active learners themselves, quality teachers of science work to expand their own knowledge of natural science and of science teaching and learning. They collaborate with other professionals to increase science learning for all.

Quality teachers of environmental education also "engage the learner in the process of building knowledge and skills" (NAAEE, 2000, p. 3). They teach across disciplines in an integrative manner, keeping "the whole picture in mind as they guide students toward environmental literacy" (NAAEE, 2000, p. 2). A balanced approach to environmental instruction is taken by these educators, as they "incorporate differing perspectives and points of view even-handedly and respectfully" (NAAEE, 2000, p.

3). Quality environmental educators "foster learners' innate curiosity and enthusiasm" by providing them with "early and continuing opportunities to explore their environments" (NAAEE, 2000, p. 3). They emphasize direct experiences with the natural world for knowledge-building and to establish commitment. They encourage independent and collaborative thinking to enhance student effectiveness towards environmental problem-solving.

In general, quality teachers exhibit high levels of motivation and commitment to their students and their profession. They are personally interested in learning and take initiatives to grow professionally. Quality teachers conduct best practices in education as suggested by the Standards and the Guidelines. They "ignore the vocabulary-dense textbooks and encourage student inquiry" because they know that students learn best by hands-on investigation (NRC, 1996, p. 12). Quality teachers are facilitators of learning who are comfortable enough to say "I don't know" to their students and confident enough to let students seek answers to their own questions of interest. They attempt to make their courses relevant to students' lives and integrate their curricula across disciplines. Quality teachers are interested in affecting change in the profession. They encourage and work with other teachers, administrators, parents, and the community to build better programs for student learning. The teachers in this study match many of the criteria for quality teaching set by the Science Standards and the Environmental Education Guidelines. They are some of the "extraordinary teachers" described in the Standards as teachers "who do what needs to be done despite conventional practice" (NRC, p. 12).

A conceptual model of Quality Teachers of Schoolyard Nature Studies has been delineated from this research. It represents the dynamic elements of such a teacher's world. The model suggests the major influences involved in *becoming* a teacher of schoolyard nature studies. It refers to the personal experiences

and beliefs that help mold a teacher and her practices. The model relates the complex nature of *being* a teacher of schoolyard nature studies. It suggests a picture of how a teacher of schoolyard nature studies thinks and acts. In addition, the model refers to the personal and professional efforts taken to develop and sustain a schoolyard nature studies program and suggests the motivational forces that lead these teacher to action.

The model of Quality Teachers of Schoolyard Nature Studies consists of three major components (See Figure 1). The first component is the foundation for the others and reflects a teacher's past and present experiences with nature. The second component has several dimensions, as it relates personal beliefs about nature to

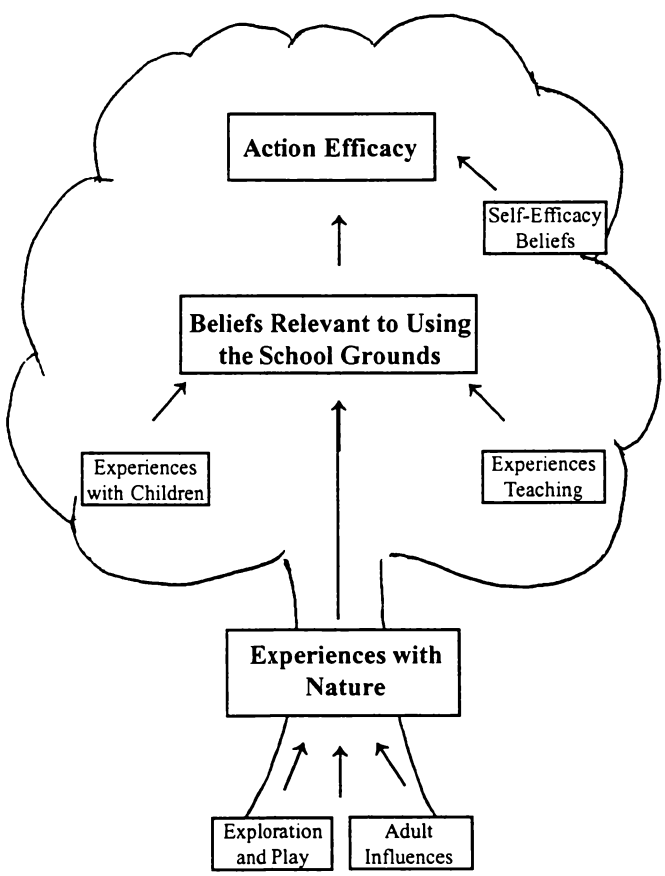

Figure 1: A Conceptual Model of Quality Teachers of Schoolyard Nature Studies

professional thoughts and ideas concerning the value of school grounds learning. These beliefs or personal convictions of a Quality Teacher of Schoolyard Nature Studies are intertwined and connected like the branches of a tree. The last component is the fruit of the other two, reflecting the action efficacy, i.e. the motivation, commitment, and actions taken by a quality teacher of schoolyard nature studies. The conceptual model of Quality Teachers of Schoolyard Nature Studies suggests the complex growth and sustainment of such a teacher.

In this chapter, the conceptual model will be used to outline and present the major findings of the study, with the teachers voices as examples and support for the model. Key categories of the findings will be presented within each of the three components of the model. Literature related to the conceptual model and interpretations of the findings will be presented in Chapter Four.

Personal Experiences with Nature

The first component presents a major personal focus for the teachers in this study. The participants share many similar stories of experiences with nature and the influences of those experiences on their lives. The key categories that emerge are: time spent outdoors, nature appreciation, and learning about nature.

Time Spent Outdoors

Spending time outside in a natural setting was a defining aspect of the lives of the teachers in this study. It was an important part of who they were that went well beyond their classroom roles. From early childhood to the present, most reported spending lots of time outside.

Spending time outdoors was an important part of childhood. The teachers in this study mentioned spending time outdoors as children, a lot of time outdoors. Some

of the participants used phrases such as "all the time" and "a great deal of time" to describe how often they were outside. The suggestion was that they were outside more than other children, or at least more than children today. For the most part, the reflections involved non-organized, spontaneous, childhood play in natural settings.

The teachers described days of carefree childhood play spent with their friends or siblings. They said it was a safer time for kids then and they had much more freedom to play on their own. Rachel, for example, told of spending much of her time outside playing with her brother and sisters:

> We lived in a small college town...and it was a very safe place. We spent a *lot* of time hiking. We'd hike ten miles a day lots of times and either on bikes or on foot. And we'd just, you know...make our own backpacks and go and we'd stay overnight lots of times....But it was a much prettier time and there wasn't organized *anything*. There were no organized sports, you know, very limited. We did our own, made our own fun. It was a very different lifestyle. Growing up in the 50's was very different from today.

Most of the participants described similar experiences with carefree play. Even Betty, who was raised in Washington, DC, commented that it was so safe when she was a child that she walked to the park to play on her own. The teachers implied that they spent more time playing outside than kids today because activities were not so organized and it was safer then.

The settings of the childhood play were described in detail by some of the teachers. It was as if they visited the places often or at least had the places etched in their memories. These natural locations of childhood play were special to them and they seemed comfortable spending time there. For example, Ann stated:

> I grew up in a rural area, with our house across the road from the main beach of a small lake. I spent a great deal of time sitting on the rocks, looking out

> over the lake, wading along the shore chasing the minnows, swimming for hours and hours, sailing, rowing, fishing, ice skating, sledding. My favorite "room" was a particular branch of a huge weeping willow that grew in our front yard. It was the meeting place of my friends and mine. I could get so comfortable there I would take a book and read, or draw.

The teachers' special places were natural settings such as lakes, streams, wooded areas, parks, and farms. The picture given was that the teachers loved playing outdoors as children and especially enjoyed spending time in natural locations.

All of the participants had stories of childhood experiences in the outdoors, except John who only briefly mentioned exploring the farm of a relative. The research question presented was "tell me about your early experiences with nature" and the teachers chose to share memories of childhood play outdoors. They did not tell stories of activities such as school field trips to natural settings or visits to nature centers. No one described class projects of collecting leaves or rocks. One teacher remembered going to zoos and museums on vacations, others told of camping in Girl Scouts, but there were few details of their experiences. The details were of outdoor play with friends or siblings. Playing outdoors in natural settings was the way these teachers perceived their early experiences with nature.

Teachers were outdoor enthusiasts. The teachers in this study continued to spend time outside as adults. Most went to natural areas or did outdoor activities on vacations. Some focused on birdwatching and gardening at home.

The teachers were very enthusiastic about their outdoor activities. In fact, they seemed almost excessive in the focus they placed on doing some of these activities. John and Linda, for instance, were avid gardeners and laughingly said, "we work in our yard, that's all we do." They spent all of their extra time working in their yard since they had a vegetable garden, an herb garden, and an orchard. Other teachers had

similar stories. Paul lived in the country and said that trees were his "number one thing." He had a nursery with "twelve hundred trees and grasses that I'm growing." Another example was Patsy who was so enthusiastic about wildflowers that she and her husband went on a "pilgrimage every year to see the mother lode" of yellow ladyslippers. They also had a vegetable garden and had a hard time waiting for the seeds to come up after planting them. She said enthusiastically:

> I plant the seeds today, I go out the next day to see if anything sprouted, I know it hasn't. But automatically I come home from school and my husband and I, we go out and have a look. We just can't help it. It's just so much fun.

Other teachers went on biking trips, rock climbing, or camping in the summers. They spent lots of time outside for leisure and to satisfy interests such as gardening. It seemed that being outside continued to be important to the teachers.

One reason the teachers enjoyed being outside was that they found it very relaxing. Being out in nature was peaceful to them. For example, Rachel loved to fish and she and her husband typically fished every day in the summer. But to Rachel, it involved more than just catching fish:

> One of the things that I've found is that trout fishing is really, *really* relaxing for me. That we do a *lot* of stream fishing and hike back in, you know, somewhere between five and ten miles a day and just fish the stream and you know, we'd go different directions and just commune with nature as your going and it's *really* nice. It's really, it gets your perspective. It's just a nice thing to be able to do.

Marilyn said she communed with nature from her front porch where she had a "beautiful view of the mountains...right in front of my house." She loved to sit on the front porch and "listen to the peacefulness." Being outside seemed to be relaxing to the teachers. They spent time outside because they were comfortable being outside.

Another reason the teachers enjoyed being outside and traveling to natural locations was that they enjoyed sharing what they learned with the children at school. When Marilyn traveled, she was constantly looking for things she could bring back to the students "to broaden their awareness of different places and different things." She loved observing the "diversity in nature" when she and her husband traveled to new places. Patsy also thought of the children when she traveled to natural locations and brought back "boxes full of rocks...*large* rocks" to share with her class. And Susan commented that being a kindergarten teacher had changed the way she observed nature:

> My focus is going down, in that, before I would look at the sky and the top of the trees; now I'm looking at things at the level of a five-year-old...So everything I'm looking at is more on the ground, more around our feet, because that is what our children observe. I find myself when I'm going places always looking down.

The children were often a focus for the teachers as they traveled and enjoyed nature.

Without exception, the teachers in the study were enthusiastic about being outdoors and observing nature. Being outdoors in natural settings was such a focus that some of the teachers could not recall a time when it was not important to them. As examples, Paul reflected that "all my life, maybe, I was outside" and Patsy stated with emotion, "I just love to be out in nature. All my life I've been that way." It was clear these teachers were outdoor enthusiasts and the time they spent outside affected their lives in positive ways.

Nature Appreciation

The teachers gained an appreciation of nature from spending time in nature. Outdoor play and exploration were major factors in building appreciation, but

spending time outside with adults, especially grandparents, also helped increase appreciation of nature for the teachers in this study.

Outdoor experiences gave an appreciation for nature. The participants reported that being outside gave them an early appreciation for nature. As children, they learned about nature and remembered being aware that it was special to them.

The time the teachers spent playing outside often involved nature study and exploration of animal life. They recalled activities such as catching butterflies, mucking in the pond for creepy crawlies, and observing insects and snakes. Larry told of spending "most of my youth" on his mother's family farm where "there was a *huge* wooded area, and creeks and, everything that you could imagine to spend time in in nature." He and his cousins "spent a *lot* of time in the creek collecting all the critters and studying the water and doing stuff like that." The teachers learned about "critters" and about nature from their playful studies. They were curious about nature and collected things like bones and rocks. Nature study was an important part of their childhoods. As an example, Marilyn remembered going walking in the woods with her dad:

> I was constantly on the ground looking for snakes and insects and various things.... So *my* love of nature came through just being outdoors constantly, like enjoying getting in the mud, wanting to hold live things, and always being thankful that I had those opportunities.

Ann's statement that she had "*always* been interested in natural sciences" seemed to be true for most of the teachers.

Being outdoors and learning about nature included feelings of awe and reverence for some of the teachers. For Rachel, the outdoors "was so serene. It made such an impression to be able to just commune with nature on a daily basis." She and Ann both described their childhood nature experiences with emotional feeling. Ann

had some difficulty coming up with the words to describe her early feelings for nature:

> So I did, you know, a lot of active things outside, but I also just did a lot of exploring....I guess I really at an early age appreciated the beauty in nature and I think that's probably what drew me more to it than probably anything else. And just, I'm not sure how to describe it, but I think I, I think I had a sense of the energy in nature.

Both Ann and Rachel implied that these feelings for nature were connected to their days of childhood play.

The participants in this study expressed an interconnection between their understanding and appreciation for nature and the amount of time they spent outside as children. Being outdoors helped them see the outdoors. They were curious and so they collected and observed plants and animals and took note of the things they observed. They learned about nature from these early experiences. They did not mention books or movies as a source of nature appreciation. They came to appreciate the beauty and "energy" of nature because they spent so much time outside in natural settings when they were young.

Adults influenced their appreciation for nature. Though the stories of early experiences in nature usually involved childhood play, the participants also commented that adults influenced their feelings about nature. Interestingly, half of the teachers recalled spending time outside with a grandparent in their discussions of childhood experiences with nature. Parents were mentioned by a few teachers, but the stories were mostly about how the parents took them somewhere on vacation or camping. The grandparent stories were different in that they included specific stories of how the adults influenced their feelings of appreciation for nature.

Being outside with grandparents in their gardens was a source of influence for some of the teachers. The grandparents did more than put them to work on weeding

and such. They took time to teach the children what they knew about gardening. Larry learned about gardening from his grandfather who taught his grandchildren as they helped him in the garden:

> I remember our grandfather talking to us about how he grew crops in the garden. He had this *huge* garden plot and we would help with the garden; harvest the garden and weed the garden and do everything that takes place with gardening. And we helped him out a lot on that.

Ann's paternal grandmother taught her the names of flowers in the garden when Ann "must have been younger than six years old." These memories were so clear for Ann that she repeated the names of the flowers, "bachelor buttons, gladioli, and poppies." Patsy's memories included a humorous story about her grandfather's influence on her interest in gardening:

> When I was a child, my grandparents lived in Kentucky, and they raised a lot of the food, and I was always out in the yard. They just had an extra piece of property beside their home and my grandfather would take me out to the watermelon patch and he would always have a watermelon there even if it's not time for one to be ripe. And I *finally* figured out they weren't all connected to the stems. He would just place it there and say, "Oh! My goodness! Look how that has grown!"

Patsy said that these kinds of things got her interested in gardening.

In some cases the grandparents' efforts were very direct at encouraging the teachers to become outdoor enthusiasts. For example, Ann's maternal grandmother who was born on a farm in 1892, had been a teacher in her younger years. She spent the winters with Ann's family and Ann stated that:

> She was a natural teacher and encouraged me to find out about things that interested me. She seemed genuinely interested herself... She didn't fuss with

> plants, but seemed to have a knack for growing things. She'd take a slip of the plant and seemingly, just stick it in the ground and it would grow.

Ann and her grandmother would go for walks outside and "she was always gardening or poking around outside." Ann stated that her grandmother led the way for her interest in nature. Rachel had similar experiences with her grandfather. She said that he was truly a naturalist:

> He was *extremely* observant. Just, you know, signs of nature and he was *constantly* pointing them out to us. And as I grew up you know I could name all the animals and all the trees and all of that kind of thing made an impression.

Rachel stated that these experiences gave her an appreciation for nature.

As children, being outside meant looking at nature and learning about nature for the teachers in this study. The teachers came to appreciate nature from these experiences. The stories of grandparents were raised by the teachers themselves during their discussions of early experiences with nature. Some of the teachers clearly remembered grandparents as people who shared nature with them and encouraged them to be outside and to appreciate nature.

Learning About Nature

The participants learned about nature through personal life experiences and from working with children. Though most wanted to learn more, they did not believe they had to be nature experts in order to teach elementary students.

They learned from experiences with nature. For the most part, the teachers in this study learned about nature from just "doing " things outside. Only two teachers discussed the science courses they took in college. Others gained a practical knowledge of natural science from early experiences and from activities such as

gardening and nature viewing.

The teachers seemed to feel good about their knowledge of the basic concepts of natural science. Larry, for example, said that he had gained an understanding of the basics from his experiences:

> As a broad overview of nature, I feel very, very good about it. If you get into very specific areas of study...like botany. I can identify trees, but when you get beyond that to wildflowers and that kind of thing, I'm not real good at that. But, an overall sense of nature and the inter-relationships between biomes and environments, I feel real good about that. 'Course I've had a lot of experience with it.

Some teachers mentioned that experiences with the schoolyard programs had increased their knowledge base. Marilyn said that her knowledge of nature had "increased *significantly*" since working on the school garden. She pointed out that she "didn't know how to grow *anything"* when they started, but had "learned a lot from Susan and just from being out there and doing it." One lesson she learned was that manure was much too acidic for planting marigolds (she thought it was potting soil). Several others mentioned that their knowledge had grown from such experiences.

Though the teachers felt they had an understanding of the basic concepts, they did not know specifics like the names of plants or animals. Susan, for instance, said that she knew the basics from gardening at home and from being raised on a farm, but did not know the names of flowers:

> I had a lot of practical knowledge, but not a lot of book knowledge as far as it comes to science. So I've had to really bone up on terms and official names of flowers, you know, that I would call the purple weed or the flower that blooms in September. Now I'm needing to label our plants out here in our garden. *I've* had to really do a lot more research so I can be accountable.

Half of the teachers made similar points about not knowing the names of certain plants or insects. Linda and John called themselves "down-home gardeners" because they recognized bugs, but did not "always know the names of them."

Along with these comments about not knowing the names of plants and animals, the teachers suggested that they did not consider themselves nature experts. An implication was that knowing the names made someone an expert or showed expertise. A couple of teachers wanted to take college science courses to learn more. Some mentioned needing references like field guides to identify flora and fauna. Others said friends and resource people helped when they had questions. For example, Ann, who wished she had majored in science in college stated:

> Although I would probably do it differently now, I've felt pretty comfortable with my level of knowledge. One thing is that I know I am an amateur naturalist and have no qualms about asking someone, an 'expert', when I need more information.

The "experts" mentioned by the teachers were college science professors and resource people in science fields like biology or horticulture.

Some of the teachers in this study had won awards for their school nature programs. Some were treated as resource people in their schools when other teachers came to them for help with questions on natural science topics. Regardless, the participants clearly did not consider themselves experts in nature studies. Though they learned about nature from personal experiences and felt they knew the basic concepts, they were interested in learning more.

They learned with the children. Even though the participants did not consider themselves experts in nature studies, they seemed comfortable about teaching nature to children. They enjoyed learning about nature with children and did not think it was that important for elementary teachers to know everything about natural science.

The teachers suggested that they did not see a need to be nature experts, in part because they did not think it was good teaching to simply give the answers to children. John, for example, felt that it was more important to help children develop a base of knowledge, an appreciation for nature, and a desire to go outside. He stated:

> Sometimes I feel it would be great to know as much as some of these other people and their ability to name everything, but I don't think that's going to happen. I'm pretty comfortable with how much I know. I mean, I'm only teaching fourth graders and you know, you get to the point where you can *tell* them the name of a plant, but *they're* not going to remember it anyway.

Ann also felt that telling students the answer was not going to help them learn. She said that when she first started doing nature studies with her students, she was probably frustrated that she could not answer all of their questions. But she changed her way of thinking and now she was "learning right along with the children":

> I spent a good many of my first years thinking that teaching was the imparting of knowledge. And uh, I think I reached that, I don't know at what point I reached, but at some point, I realized this is not going to work this way because I don't know these answers and it's not the way to teach.

The teachers suggested that it was a relief not to have to be, as Paul declared, " Mr. Know-It-All about Nature."

The teachers presented a willingness to learn with the children. Instead of experts in nature studies, the teachers saw themselves as co-learners with the children. As Susan stated:

> We let the children be our teachers, you know. Just watch how the children approach it and approach it from where their questions are and if they're interested then they're gonna remember and retain what you share with them...I guess I've learned as much, more from children than anything I've

taken and they give great ideas of ways to incorporate things into their learning. They are by far the better teachers.

Learning with the children was a common theme among the participants. Marilyn said that when she learned along with the children it made the program exciting for all involved, including herself. When they learned together, the excitement was contagious. As Rachel stated, "Learning with children is a wonderful thing!"

The teachers enjoyed learning about nature from their own experiences and from working with children. They saw learning with children as a wonderful thing for several reasons. They did not have to be experts this way, and in fact thought it was better not to tell the answers. It was more exciting for everyone to learn together from the experience and for the teachers to be open-minded about learning from the students. The teachers did not see themselves as nature experts, but they had learned enough from their experiences to make them comfortable about doing nature studies with children.

Summary Of Personal Experiences With Nature

The first finding of the study was that teachers of schoolyard nature studies had many childhood and adult experiences with nature, and these outdoor experiences instilled an appreciation and understanding of nature. As children, the teachers were encouraged to appreciate nature by their grandparents and parents. They learned about nature from their personal experiences outdoors and from working with children. Though they wanted to know more, they enjoyed learning with the children and did not think it necessary to be nature experts when teaching elementary school. The teachers' experiences with nature were the foundation for their beliefs about nature and sharing nature with children.

Beliefs Relevant to Using the School Grounds for Nature Studies

This second component refers to the variety of beliefs the teachers have about taking students outside on the school grounds to study nature. They believe that children should spend more time outside and that children need to learn about nature. The teachers report many positive benefits for using the schoolyard programs, including benefits for the children, for themselves as teachers, and for the future of the planet. Key understandings focus on the children's engagement with nature and the role of nature learning on the school grounds.

Children's Engagement with Nature

The teachers had strong beliefs that it was good for children to spend time outside in nature. They thought that spending time engaged with nature helped students feel closer to nature, understand nature, and therefore learn to appreciate and protect nature. The teachers worried about the social and environmental problems facing their students in the future, and they hoped that engagement with nature would give their students the foundation needed to make a better world.

Children need discovery time outside. Several teachers commented that students needed to get outside at school because they did not spend time outside at any other time. They thought that children just did not have discovery time outside anymore or adults who encouraged them to spend time outside.

Whether the schools were located in the city or country, the teachers saw a need to take students outdoors to introduce them to nature. A couple of teachers thought that it was because their students lived in a city that they did not get outside to enjoy or explore nature. Larry, for example, remembered his days on the farm and wanted to share similar experiences with his students in the city to give them "a better appreciation of nature." Paul also wanted to share nature with the urban children in his

class. He commented that the children in his inner-city school had seen horrible things occur on the streets, and he wanted them to experience being outside in a more positive setting:

> This particular school, these students do not get much one-on-one time with their parents. I think 84% of them come from single parent homes and a lot of times that isn't even the parent. They live with grandparents or friends or whomever. And, most of them have, just about the same number have seen somebody dead, like killed, right in front of them. You know, and I've never even seen that in my whole life and almost this whole school has seen that....They're coming from a whole different place and they have not had a lot of real kind of discover time I guess, with anybody, with an adult or somebody that kind of cared about them. And they, they play a lot and watch a lot of TV is mostly what they do....So they know their streets...They know which houses to stay away from because there's drug sales or guns, things like that....They know that, but I want to teach 'em the other things. Maybe the more *gentle* things.

Paul and his students designed and planted a nature trail around the school playground. To teach the "more gentle things," Paul had the students plant trees along the street and create a natural field guide of the area.

While the teachers in urban settings implied that rural areas provided better places for children to play outside, the teachers in rural settings were also concerned that their students did not spend enough time outside. John felt that the rural children at his school watched too much television or played computer games instead of being outside:

> We live out here in the country and it's primarily agricultural, but the kids that we work with, there's maybe only two that live on a farm out of a class of 20.

> And they know very little about how nature works. They're watching TV, working on computers, and playing Nintendo any more. You know, they don't go outside and take hikes or anything, as much as they used to anyway.

Other teachers suggested that the students watched too much television or played computer games instead of going outside. Taking students outside to teach the more "gentle" things to help children learn to appreciate nature seemed to be a goal for most of the teachers.

The participants thought that sometimes just going outside was enough to instill appreciation for nature, i.e. the teachers did not have to be teaching a concept or lesson. Some teachers said that they took students outside for lunch in the garden or just to sit and listen. Ann, for example, stated:

> There's also just the benefit of getting out doors. Just getting out of the seat, out of the classroom, out hearing the other sounds, hearing the sounds of nature....Outside you feel the breeze, feel the sun on you. I mean it's just, it's a sensory thing....I think those are tremendous benefits for these kids. Just being outside. You know there are times when we do go out and we just sit and just listen and feel and experience. That is sometimes you know in prep for a writing activity they may be doing back in their homeroom or something. Sometimes that's all we do even if it's not for that.

The teachers suggested that the children would come to appreciate nature if they learned to sit still, listen, and become more observant. They wanted their students to experience the beauty in nature, and to notice the details. John stated that his students often saw the surface of things instead of details like aphids on a rosebush or the veins of a leaf. Noticing details might add to their appreciation of nature.

When they were children, the teachers played outside and enjoyed nature; it was a simpler time. They wanted their students to have similar experiences through

real discovery time outside. It seemed important to them that children played outside, explored the details, and noticed things in nature. The participants believed that their own early experiences in nature helped them develop an understanding and appreciation of nature. They seemed to hope their students would learn to appreciate nature in the same way.

Children need to connect with nature. The participants felt that when the students went outside, they were able to connect with nature in a personal way. This school ground connection with nature provided opportunities to teach lessons beyond the small scope of the child's world. The teachers suggested that being outside helped children see themselves as part of the planet, not just as members of an isolated classroom.

Teaching life-lessons that connected students to the earth was an important component of the schoolyard habitat programs for several of the teachers. When the students studied nature on the school grounds, they learned lessons of cooperation and caring for plants and animals. These lessons came from experiences such as eating food they grew themselves and observing the death of insects. Susan expressed her reasons for this focus:

> We cooperate with nature. And basically, we have to have those life skills to get along in our world and in our environment. And unfortunately we haven't all learned that because that's why we're in such big trouble right now. We've abused it. We've taken advantage. We have not worked cooperatively with each other using patience, caring, and taking care of the resources we have. And so it all goes hand in hand.

Marilyn concurred with Susan's thoughts. She felt that children needed to have outdoor sensory experiences and learn to "apply that knowledge to themselves and how it affects them personally." She wanted them to see that they were "part of one

big community together" and had "an impact on the world."

One way that Marilyn and Susan taught these life-lessons was through a unit on the life cycles of plants and animals. They wanted the students to value life, but also have an understanding of death. Susan commented on the connection:

> If children can understand the life cycle of plants and animals and insects, it better helps them deal with the lifecycles of people. Our young children are on such an *early* part of their lifecycle, that they really haven't experienced death. If they have, it's usually through a pet or something else, an animal or something they have loved, or it can even be a plant that we sort of bring to their attention, when its lifecycle is over. It will help them better understand how the lives of plants and animals can be transferred to people as well in the hope that it will give them a little better foundation for understanding the experiences that they're gonna have later on in their lives.

The children in Susan and Marilyn's kindergarten classes had few problems with valuing life, in fact they tended to care too much. Helping the children better understand death was a challenge for the teachers. Susan told a story of one student who got upset over the death of a fly.

> We had a bug zoo day and I had a child bring in a fly and it had died before he got here to school and he was traumatized, because he really wanted to let it go before it died. So we had to look at that and say you know, we are sort of like scientists. That fly had a very important life because now we can study him. And we can see his six legs and know that he's an insect. If he were alive, he'd be moving so much we couldn't observe him. So he's had a very important life. He's contributed something to our learning. So that seemed to appease that child, but you know, they're really soft-hearted now and they *really* value the life.

The kindergarten teachers worried about the children losing that respect as they got older. Susan commented that she wanted to see respect for life fostered more in the curriculum in upper grades. Paul concurred when he stated that teaching kindness for living things was a lesson he hoped to teach to his third grade students. He mainly wanted to teach them to just leave the animals alone, that "we can't *kill* every bug that we see, just 'cause it's there, you know. Sometimes we have to leave 'em alone." He hoped to teach things like "responsibility, caring, concern, compassion...for things" by taking students outdoors. Paul's school worked with a life skills program that he transferred from the classroom to his school grounds program. He wanted his students to care about the environment as well as each other because "we're all here together."

Caring for plants and understanding the connection to plants was also a focus for some of the teachers. Paul brought in trees for the students to plant, mulch, and care for; he discovered that they had named the trees and remembered the ones they planted. They made a connection to "their" trees. Similarly, Patsy found that growing a garden helped students connect with the sources of their food:

> Children that live, especially in the city, and even the suburbs, they don't have a clue. They do not *know* where things come from. They eat it and they don't have any idea where it comes from, whether it be plant or animal. And they're *so* amazed to find out. You know, and participate in growing and we're making gardeners out of them too. They're going home and they're starting their own little gardens. My kids got interested in herbs because we just started them in our garden.

She hoped that this connection to gardening and growing their own food would carryover for her students and they would become gardeners as adults.

The teachers postulated that by helping children understand the connection

between themselves and the plants and animals on the school grounds, they would better understand their relationship to each other and the planet. As Betty pointed out, taking students outside provided an opportunity for students to see that "it's not just the school, it's part of the world." They were not "on a spaceship somewhere else." They had a personal connection to what happened on the school grounds and the planet.

Children need to develop stewardship. Most of the teachers mentioned concern for the environment as a reason they took students outside to do nature studies. They wanted students to develop an appreciation and understanding of nature in order to become better stewards of the earth.

The teachers were aware of environmental problems in their local areas and world-wide. They spoke of the lack of awareness among students concerning environmental issues. Paul commented that the adults in his student's lives tended to be irresponsible in many ways, from allowing the children to watch inappropriate television programs to not providing food. As a result, the children did not have good role models for responsible environmental behavior. He said they needed to learn simple responsibilities such as picking up their own trash and keeping areas clean. Ann had a different concern in that her students lived in such a beautiful environment, they were unaware of the problems in other areas:

> I'm very, *very* concerned about our environment and I've pretty much given up on adults and changing their behaviors. And I feel really the only hope we have is in raising the level of knowledge of these children and getting them in contact with nature. Even though these children grow up in a rural, in an absolutely beautiful place, and many of them have backyards that are just absolutely gorgeous woods or pastures or fields, or obviously very well taken care of land, that their families have been good stewards, they still don't

realize how valuable that is, that they don't *have* to worry about breathing bad air or drinking bad water.

Ann aspired to help the children value the beauty of the area. She drew a link between having understanding and appreciation for nature and having concern for the environment. She expressed this further when she discussed her efforts to help children see and understand subtle differences between species. She said her goal was to "wow" the students:

> And I feel if they're wowed by it, they're awed by it, and at *some* point, and I gotta believe this, you know this is what I hold on to, that if they have that awe, ...reverence that may be there, and if there's reverence, then stewardship will follow.

Ann hoped her students would understand the importance of respect for the environment. She and others felt that if the students learned about nature on the school grounds, then they would care about the environment. John tried to make this clear when he quoted Aldo Leopold: "To protect something, you have to love it. To love something, you have to have knowledge and understanding of it."

Some of the teachers were looking to the future with their efforts to instill respect for the environment. Linda's goal was that her school grounds program would help the students "develop a base of knowledge from which they can go out and affect change in their environment." She wanted the students to realize that the earth belongs to them and remarked about their futures:

> They'll be the caretakers of this area, one day, they'll be the mayors and the council members, the voting public. There's a lot of waste management issues in this area because of the poultry farms, there are so many poultry farms here. The Save Our Stream volunteers and Friends of (the) County volunteers will need new members. We want them to take care of it, so they need to have a

basis of understanding. They shouldn't feel apart from it.

Having students who become caretakers of the planet was a goal mentioned by several teachers. Larry said that he thought the environmental awareness students gained from the school grounds program provided a "much better steward of the planet" and made them "good world citizens." Paul's goal for his students was that "as they grow up, I want them to be, my ideal would be for them to be model citizens concerning the environment."

The teachers in this study seemed knowledgeable of environmental issues and had concerns about the future of the planet. None of the teachers spoke of a "green curriculum" that only focused on teaching about environmental problems. Instead they seemed to focus on instilling an appreciation and understanding for nature through their school grounds programs. The implication was that if children developed an appreciation and understanding of nature, they would be better stewards as adults. This hope appeared to be one reason the teachers put effort into their school grounds nature studies programs.

Getting students to spend time outside was a focus for the teachers in this study. They saw many benefits for outdoor nature exploration such as developing appreciation for nature, connecting with nature in a personal way, and instilling a sense of stewardship for the environment.

Nature Learning on the School Grounds

The participants had firm convictions that doing nature studies on the school grounds was a good way for children to learn. They believed that children learn best through real experiences and their methods on the school grounds mirrored this belief. They believed that the schoolyard provided a real and relevant setting for learning about nature. The teachers were excited about the educational benefits they observed

from taking students outside, in part because they thought the children liked it so much.

Methods reflected their beliefs. The methods used by the teachers on the school grounds reflected their beliefs about teaching and learning. The teachers designed their programs to make learning real and meaningful for the students. The students were able to experience things first-hand rather than simply read about them in a textbook. The teachers expressed strong opinions that this was the best way for students to learn.

Hands-on was the term used most often by the teachers to describe their teaching efforts. For them, hands-on meant taking children outside to plant gardens, design habitats, observe nature, and collect data. They believed with a passion that their students learned best by doing. Marilyn suggested that when the students were outside studying nature, they were able to use their senses to "touch and feel and see and taste and experience...real live objects, or living and non-living things" and it became part of their long-term memories. She felt that because the children had time to sit and observe a real object, talk about it, and watch it over time, the students learned much more about it.

Though not all of the teachers used the term inquiry, most gave examples of inquiry-type lessons as part of their discussion of a hands-on program. They spoke of letting the students' questions guide the learning process, which led to student or class investigations in search of answers. Rachel said the key was that the students *were* scientists, using the tools of science to do real research on the school grounds. This helped the students "really understand it";

> I think it gives children an opportunity to experience. And that's how they learn. They learn by experience. And observing and experiencing nature is the way they learn... Not just read about, but actually *do* it. And they do all the

work, I mean they really do. They do all the planting, they do all of the observations, all the data collection, and even all the computer, everything.

Her students analyzed and reported their data to the state game agency. Rachel indicated that students "retain 90% of what they've learned if they're doing it." As evidence, she and several other teachers shared stories of students who came back from middle school or high school with detailed memories of the hands-on investigative activities they did on the school grounds as children.

Another important aspect of most of the teachers' programs was getting student input. They wanted to begin with what the children knew, and then involve them in the process of learning. Ann said that her rural students were aware of the local fauna, so she always tried to start any new area of study with "what they know and what their experience is." She remarked that sometimes they brought in an "incredible amount of knowledge." Larry described how his students had input into the learning process:

> They learn from the hands-on experiences in which they're involved. They also design a lot of the investigations themselves so they're in on the planning as well as the implementation of the project or the experiment. So they get some, they get some input into the content and the approach to the lesson when we go outside.

The teachers felt that involving students in the entire process made it more relevant to them. They were less apt to question 'why do I have to learn this?.' Rachel also commented that when students saw a reason to learn, they were more likely to learn.

Integration of subjects was another common method used by the teachers in this study. As an example, Susan and Marilyn used a thematic approach, with the outdoor garden as their focus. They often started the beginning of the kindergarten year with a study of living and non-living things and most of their activities from

reading to math centered around this theme. Rachel concurred that it just made sense to teach using these methods, because it was the only way children really understood "what's going on":

> I very much discovered that if they weren't doing it hands-on, if it didn't make any sense to them, all they were doing was fixating on a very small part of it. And they were making no connections to anything else. They weren't getting a composite. That by doing it, doing it in all different respects and tying it, not just to one area, not just to math or to science, but doing it across the curriculum into science, math, you know, language arts, technology and social studies, whatever you can, that the kids *really* have a much better understanding and it makes it possible for you to teach *all* these subjects, rather than isolating them. Because we don't learn in isolation and why anyone ever thought children learned that way is beyond me.

The teachers were adamant in their statements that children make connections and understand concepts better with an integrated curriculum.

Several teachers mentioned that this way of learning was much better than relying on textbooks or worksheets. With textbooks, they suggested, the students were reading about science, not doing science. Paul commented that the students could not "escape" from what they were doing in a hands-on situation, but it was easy for them to drift-off when reading the text. He also felt that the book was not as meaningful to the students. As for run-off worksheets, Marilyn said that "you wouldn't see those in our program, because just giving information and asking for feedback, they're not getting up into that cerebral cortex that we talked about..." She quoted Susan Kovalik, "Run-off dittos are insulting to any person's intelligence."

All of the teachers supported similar teaching methods and their comments conveyed a knowledge of the Science Standards and the dominant theories currently

guiding education. Some quoted authorities on integrated thematic instruction, others used terminology from multiple intelligences theory. They seemed to know what they wanted to accomplish and had firm beliefs about the best practices to get there. Larry commented about his program:

> It's a very good match with my philosophy of learning because I'm a *big* proponent of experiential learning and this is a natural fit. If you get children involved and excited in what they're doing they're going to naturally remember it and retain it and eventually get it over into long-term memory a lot better than if they are doing something that's fairly passive. So it's an excellent match for me.

The enthusiasm the teachers showed for their programs suggested that this way of teaching was an excellent match for all of them. They had difficulty accepting the fact that more teachers did not use these methods.

Schoolyards were learning habitats. The school grounds were the focal point for the hands-on, integrated methods of the participants. They saw many benefits in studying nature right outside the doors of the school. To them it provided the best setting for real learning.

Several teachers told stories of how they once taught nature themes in the classroom, instead of taking students outside. They read about nature in textbooks and even did hands-on activities to try to teach the concepts. Their programs were integrated and they got recognition for their efforts. But slowly they started to rethink "the point" of what they were doing. Paul said this happened with his integrated rainforest unit:

> I used to teach the rainforest in here in the classroom and I guess that's what I'm most known for. People always, you know, I want to see the rainforest. We turned this room into the rainforest...And all the spelling words and math

> and the reading, everything is generated from the rainforest and I mean, these kids, they *knew* who Chico Mendez was and they knew how to spell "piranha".... And when they walked into the room, they knew they were in the rainforest and it was inescapable. But I don't do that anymore and have not for two years... because I now believe that the students - and I know that this is true, their world, and in elementary school, their world is about fifteen minutes away from where they live. And yeah, they know the Chico Mendez's, but it's really not very meaningful to them. What's meaningful is what they find out on the playground.

The teachers who told similar stories questioned how nature in some far-off land could be meaningful to the students when they had not studied their own environments. Ann commented that "when you are 6 to 8 years old...it's really hard to connect with some distant land, but if you take them outside, well there you are! and everything is right there for teaching about nature."

With everything right there, the teachers considered the school grounds a convenient place to study nature. They did not have to go on field trips away from the school, which was actually getting more difficult because of expenses and liability concerns. Several teachers mentioned that their schools were within walking distance of other natural areas, but the schoolyard was still the focus of their programs. Most had developed their school sites into natural areas with gardens and/or ponds. They had both flower and vegetable gardens where they studied the entire process of plant growth, from germination to harvest. They observed animal life as well, collecting data mostly related to insects and birds. Also, they were able to study plants and animals in context of each other. Several of the school sites had small man-made ponds with water lilies and fish, a place for the study of aquatic life. These settings were just outside of the classrooms and definitely convenient for daily, continual,

long-term studies.

Because of the convenience, it was easy for the teachers to make connections between what was happening right in the schoolyard and the rest of the curriculum. As Rachel explained, the class could not visit the ocean, but if the students understood the dynamics of a pond, they could "certainly understand the same kind of thing that's happening in the ocean." This "constant connection to real things" was key for helping Rachel cover the state standards more thoroughly. She said that there was "no better way" to cover standards such as those on biodiversity, food webs, chains, and pyramids than with an integrated study of the schoolyard. The students could see "how the whole thing works together." She said that the kids really understood so much better because they worked with it every day right on the school property. Other teachers suggested that they were also able to relate much of what happened on the school grounds to their entire curricula.

Another benefit to using the schoolyard, according to some of the teachers, was that the children were comfortable being there. They were in their own environments and therefore, it was non-threatening to them. Some students came to work in the gardens on Saturdays and before/after school, so learning was not restricted to school time. The teachers also suggested that the students felt ownership for their schoolyard habitats and because of that, vandalism was not a major problem. The teachers appeared to find the school grounds a perfect habitat for learning.

Nature was a kid grabber. According to the participants, the children really enjoyed doing nature studies on the school grounds. The students seemed to have a natural curiosity that drove them to fully participate in the activities, which in turn made it more exciting for the teachers.

The teachers found it easy to engage the children in doing nature studies. Some suggested it was the easiest material to teach because the activities automatically

stimulated "student's motivation and interest." Rachel implied that the interest level was so high, the only challenge was getting students to do other things:

> One thing that is really, really important is that's what children are interested in. Children *want* to learn about nature. They *love* to learn about animals. They just *love* to learn about 'em. Whether they're aquatic or terrestrial. They have the extremely high interest in it. There are other things that they, that they could care less about. But that is one thing that if you ask children, of all ages, if they would like to learn about, about animals in their environment, they *all* want to do it. And I've never heard a child say I don't want to do this. In fact, a lot of them, that's *all* they want to do! It's really, a riot and that's what they want, they want to read about it, write about it, you know, and all, every aspect.

Because the students were so excited about studying nature, some teachers used it as a "kid-grabber" to get students interested in learning other topics and skills. Susan found that using nature themes helped engage every child in the learning process. She said that "young children are naturally curious and they're naturally observant and they love to explore," so with nature themes, it was easy to keep their attention. All she needed to do was "plan good activities that support good learning."

Some of the teachers shared stories to demonstrate the children's high interests in nature studies. Patsy told of an evening event where parents and students came to work in the gardens together. She was surprised that the children did not want to leave to go to a sister's ballgame or home to watch television, they wanted to stay and work. Another time she did an activity during class where the children looked through the compost they created:

> We went out and spread out plastic and we took compost...and they sat down and they went through the compost with magnifying glasses to see, you

know, if they saw any insects in there that were helping to be decomposers, worms, and that sort of thing. And it was like they had gone to the most fun party you have ever seen! "Oh! Ms T! Come over here quick!", "Quick! Look at this!"

Patsy said that the majority of her children loved science, because they were just so excited about these activities. Paul also discussed the excitement his students displayed when doing nature studies. He was most surprised when they wanted to continue the activities during recess:

> They get excited and then, when we get really going outside like working on our field guide and we've been working on it and then we come back in and do something and then we go out for recess...They head over to the nature trail and they're still digging around, still finding more ants and spiders and stuff like that...During their playtime! And they're bringing their stuff in from home. I mean, these kids don't bring stuff from home. Usually, because they don't have anything. But, you know, once we really get going on this, then they start bringing endless jars of stuff. And I think this happens maybe more in other schools, but it does *not* happen here. And at this particular school, the rewards of teaching are few and far between. We have to look real hard for them. And that's for me when it's at its best.

Paul commented that it was "really fulfilling" when this happened in his class.

The schoolyard was a great place for teachers to share nature with children. The participants suggested that the school grounds were convenient, comfortable for the students, and easy to fit into the curriculum. They found that students were excited about learning on the school grounds and that the schoolyard provided a real setting for learning.

Summary of Beliefs Relevant to Using the School Grounds for Nature Studies

The second finding of the study was that teachers of schoolyard nature studies had very strong beliefs about the need for school grounds programs and the positive benefits of such programs. In discussing their beliefs, the teachers referred to several dimensions of their worlds including: their own experiences with nature, their experiences with children on the school grounds, and their teaching experiences. The participants' beliefs or personal convictions about their schoolyard programs seemed to be based on a complex construction of meaning related to these three dimensions of their lives. For example, they referred to their own childhood experiences with nature as they discussed what they believed was important for their students. They expressed the belief that nature experiences, similar to their own, helped children connect to nature in a personal way and established stewardship of the earth. They told how they enjoyed learning about nature and shared similar observations of their students on the school grounds. They gave examples of students who were so excited about hands-on school garden activities they did not want to go home or to recess. The teachers' beliefs relevant to their schoolyard programs seemed to motivate them to take students outdoors to study nature.

Action Efficacy of Teachers of Schoolyard Nature Programs

The last component of the model pertains to the action efficacy of the teachers. Action efficacy refers to the teachers' action-oriented behavior, displayed through their motivation and commitment to doing schoolyard nature studies. It relates to both the teacher's beliefs about her program and her personal feelings of competence. The teachers believe in their goals and they believe they are capable of providing a quality schoolyard nature studies program to their students, therefore, they take action. The

categories that emerge are: motivation to action and commitment in the face of difficulties.

Motivation to Action

The teachers seemed to have common motivations for doing nature studies on the school grounds and they put forth great effort to make their programs successful. There were a variety of stories about what motivated them to initiate the programs. Most of the programs evolved over the years to become what they are today. Grants were available to help fund the programs. The teachers presented little doubt in their abilities to accomplish their goals.

Getting started. It was sometimes difficult for the teachers to remember what sparked their ideas about starting a schoolyard nature program. Taking a workshop was the most common memory. Others had classroom situations that seemed to simply move in that direction.

Most of the participants suggested that teacher workshops gave them initial ideas for their schoolyard programs. A variety of workshops were mentioned including Project Wild, Project Learning Tree, Wild School Sites, Project WET (Water Education for Teachers), AIMS (Activities Integrating Math and Science), and SYEFEST (Schoolyard Ecology for Elementary Teachers). These workshops provided resource materials and activity ideas. Project Wild, a wildlife conservation education program sponsored by most states, seemed to contribute the most influence, with seven teachers including it in their discussions. Rachel credited a Project Wild workshop with giving her the inspiration needed to begin her program:

> And I think that really got me fired up and coming back and saying, you know, this is really good, this is what we need to be doing. And we need to be doing it with children and then from there it's just developed over the years....

John also commented that a workshop sponsored by Project Wild called Gardening with Children inspired him to go back to his school and say "OK, I'm doing this."

Several teachers indicated that they got some ideas from schoolyard habitats at other schools. Susan and Marilyn had once worked at a school with a small butterfly garden, giving them ideas for developing their more extensive outdoor classroom. Their goal was to create garden beds of butterfly and ladybug attracting plants, as well as beds with an "18 inch workable garden space" for each student. John and Linda also got ideas for their schoolyard program from other schools. They found that the school gardens they visited tended to be either "just for looks" or completely run by kids with little care. They decided on "middle ground between a nice place to look at and something the kids can actually use." It did not bother them for students to be running through the beds, but they also wanted the gardens to look nice for parents and other visitors.

These initial ideas evolved into some pretty extensive schoolyard habitats. Patsy used a metaphor to describe the growth of her school's program: "It has gone from you know, a little seed that has sprouted into a big oak tree." It was obvious that she took pride in the schoolyard, and she credited an enthusiastic parent at her school for getting her involved in starting the program. The program had "grown" to have gardens all around the school, a school trail, a greenhouse, and compost bins.

Some of the schoolyard habitats, such as Susan and Marilyn's, were planned in detail from the start. Before starting their gardens, they researched the soil types and kinds of plants to use, meeting with resource people from the local university's landscape program. Flower beds for the young children were their initial idea, but they added plants to attract wildlife, put out and maintained bird feeders, and provided a water source for wildlife. The gardens eventually qualified for Backyard Habitat Certification with National Wildlife Federation since they provided a year-round

source of food, water, and shelter for the wildlife around the school. Though some programs were planned, others seemed to just happen. For example, Paul first started taking students outside because they could not read the science textbook and he had to come up with other "stuff" to keep them interested. The design of his program was not necessarily "a planned thing":

> I started a little garden my first year and got a little recycle program going...and so that grew and then the garden grew and got better and had the whole school involved and then the nature trail got started and it started growing. So really, I never had a plan, a vision, of what I'm gonna do, it's just a matter of a series of pieces that came together.

The pieces that came together involved the nature trail, vegetable gardens, and compost bins.

Whether planned or not, the ideas evolved into active school ground nature programs. Though the teachers seemed to have a variety of sources for their ideas, the common link was that they all followed through. As John stated: "You just got to that point where, you have this in the back of your mind and it's something you want to do and so I finally just reached that point where you go out and do it." Some of the programs produced famous results, from a State Environment Conservation Award to an Elementary Science Teacher of the Year Award.

Finding funding and support. The participants did not seem to look at funding as a major hurdle. They got support from a variety of sources, including grants, local businesses, and the community. They seemed very determined to find ways to fund their programs.

The funding mentioned by the teachers did not come directly from their school divisions. Some wrote the grants on their own, others had school grant-writers or parents write the grants. Most of the teachers had received more than one grant to

support their schoolyard habitat programs. Grants came from organizations such as the National Gardening Association, Bechtel Group, State Environmental Endowments, Junior League, and Chamber Grants. They ranged from a few hundred dollars to ten thousand dollars from each organization and sometimes included materials such as child-sized garden tools. Some teachers said that writing grants was not that easy at first, but they seemed to learn from their efforts. Susan gave advice, "if you know what somebody has money to spend for, you can usually tie it into whatever you're trying to do by just making that a part of your component." It appeared that after receiving one grant, the teachers were more confident about applying for others.

Support also came from local businesses. Local nurseries gave plants or discounts. One even helped install a pond. Home Depot adopted one school and supplied them with fencing and a person to help with installation. Rachel explained why it was best to start locally when looking for funding:

> We've gotten a *lot* of local funding. For example, from Walmart. They've given us over a thousand dollars. I mean, a little bit here and a little bit there....So, I mean, go to your Walmart, I mean it takes nothing to fill out the form, maybe 15 minutes and just tell them that you really want to get involved in attracting wildlife to your school (and they've got that Backyard School Program with the National Wildlife Federation). At first they were just giving us birdhouses and a couple trees. Then when they saw what we did with them they wanted to give us *more* and *more*. So I mean it's really built on itself. And I really encourage teachers to do it locally first.

She suggested that the big national grants like ones from the Toyota Foundation were difficult to get and it got discouraging applying for those. She had much more luck with local funding, perhaps because she promised to give the businesses credit on the

school web site.

Parents were also a big source of support for the schoolyard programs. Though some parents gave funding as business owners, others gave their time and expertise. Some volunteered with the schools through the Master Gardeners program, but mostly they participated in family work days, where parents and children came together to work in the gardens or on trails. These work sessions instilled a sense of community and ownership for the schoolyard habitat, according to the teachers. In addition, it gave parents a better idea of what was going on at the school and it involved them in the learning process. This involvement helped the teachers get support from parent organizations. One example was when Marilyn and Susan were offered Windows on Science, a laser disc program, from the school boosters. But Marilyn told them what the room really needed was a window where the kindergarten children could watch wildlife:

> We said...rather than using that money to buy more Windows On Science laser programs, we need *a real window to science*. So after much deliberation and, and getting pricing and various things, we now have a window on my side of the room which has reflective glass and it's large enough to accommodate five to six children at a time, which is as many as would be in that area at one time. And it gives us a direct link now, we can observe those birds in the winter from the inside comfort of our classroom. And then, we put that information right into our science journals.

Susan added that the window had "opened up lots of learning opportunities" because the children could observe the "shy" wildlife before they disappeared from sight.

The teachers suggested that getting the funding they needed was not always easy, but they looked at it as a challenge, not a setback. No one complained about the extra effort it took to support such a program, though a few suggested they thought

the school systems should give more help.

Sustaining the motivation. The teachers remained motivated to put effort into their programs, even after several years. They suggested little doubt that they could accomplish their goals. Their continued enthusiasm for the programs was apparent from their stories. They enjoyed the work and found it fulfilling.

The participants were ambitious teachers who put forth extra effort to maintain and improve their programs. They seemed to be willing to try out new ideas, and to do what was required to make them work. Several teachers told stories of events or activities with their students that took quite a bit of effort on their parts. Instead of complaining, the teachers tended to laugh about the "craziness" of some of their ideas. As an example, Patsy told of an experience planting pole beans:

> My kids, two years ago, did a thirty foot tall bean tepee. It reached, not up to this window, but it was more, way more than a story high...We tied it into a lot of different subjects, as much as we could. But they planted the beans and my husband and I got this cane from some people out in the country, and we hauled it, I don't know how we got it here, it was so long, just teetering out of the truck, and that *did* get banged a lot. But it grew very well...totally covered with bean plants and beans. I think if the poles had been *sixty* feet tall, they would still be going.

Others told stories of bringing in plants or materials to supply the gardens. The after school activities and parent work nights also required extra time and planning.

The teachers were very determined individuals who did not give up easily, perhaps because they believed so strongly in what they were doing. Their comments suggested a belief that they could accomplish their goals, even though it was sometimes a challenge. Susan may have summed up the determination displayed by all of the teachers when she stated:

> Well even as a young child...I didn't like anybody telling me I couldn't do anything. I just wanted to feel like where there's a will, there's a way. And that if you just put enough minds together and think it through and can approach it in a positive way, if you just don't give up, eventually you will get something, some movement forward. It might not be totally what you want, just don't give up. Just keep bringing it up and eventually people get tired of listening to you and will usually give in enough to get you quiet. I guess that lets you keep going forward.

The teachers seemed to follow the philosophy suggested by Susan: "where there's a will, there's a way.

The teachers had positive attitudes about accomplishing their goals and they found rewards for their efforts through positive experiences. It was obvious from the teachers' stories that teaching nature studies on the school grounds was fun and "fulfilling" for them. For one thing, they enjoyed being outside and were personally interested in studying nature. Paul even admitted that he liked it because he got to be a kid again and was right there with the students in wanting to get outside to explore. Mostly, however, the teachers found the activities fulfilling because they loved the children's excitement and were thrilled with the learning taking place. Patsy remarked that this way of teaching was "a lot of work," but "so gratifying...To see these kids come in and they're so excited about science! And it just gets *me* excited." She said it was a "joy" and "a reward in teaching" to watch the students enjoy learning. Others had similar comments. For Rachel, the most exciting part of the program was watching the students "learn and grow and understand and, and apply it." She said it was all of that, but it was also "just the joy of them being outdoors and of them really seeing...how really important nature is and watching their skills improve." Betty also enjoyed watching the skills improve and was excited about having to keep ahead of

her students:

> I feed off of the children's responses and the little lightbulb or where...you know they're interested. And then go off for weeks afterwards and bring in critters and tell you about a bug they saw....So it's the way the children react to it as well that does it for me. I'm still interested in it. And I'm gonna be interested until the day I die, but that was the biggie in the school...the more the class made you put your track shoes on to keep ahead 'cause they've absorbed everything, the more exciting it was for me.

The teachers did have a personal interest in nature studies, but they also enjoyed taking students outside to do nature studies. They were rewarded for their efforts by the positive reactions they observed in children. It was fulfilling to them as teachers to watch the students enjoy learning.

The teachers in this study took the initiative to learn about and begin their schoolyard programs. Workshops, such a Project Wild, gave them initial ideas. They found funding in the form of grants and from local businesses and parents. The teachers were motivated to take action, to do what was needed in order to establish their programs. They maintained their enthusiasm and put much effort into their programs because they enjoyed what they were doing and found it fulfilling as teachers.

Commitment to Persist in the Face of Difficulties

The participants were committed to overcoming roadblocks in order to make their programs successful. The most common problem faced was getting other teachers involved. Most of the other difficulties pertained to a variety of management issues.

Challenges involving other teachers. By far the biggest frustration the participants faced was getting (and keeping) other teachers involved in the nature programs. This issue was discussed more than any other by the participants, and it was clear they had given it much thought.

The teachers in this study were obviously disappointed in the lack of interest shown by some of the other teachers in their schools. Though a few of their co-workers participated fully in using the schoolyard habitats, the participants wondered why more teachers did not. They saw resistance from other teachers, inferring an unwillingness to change from a traditional way of teaching. "They can't leave the textbook" was Linda's explanation and others made similar comments. Some felt that teachers depended on the textbooks for content because they did not have a science knowledge base. Susan concluded it was because they did not have the "openness or the *willingness* to put that extra energy into it." Others wondered if most teachers were simply uncomfortable in the outdoors, or if they had unpleasant memories of outdoor experiences as children. John thought it was a combination of these things:

> I think it still goes back to some people are used to doing their thing in their classroom and working out of the book and other people don't know anything about gardening. They don't have a garden at home so they don't know what to do exactly and they've never taken a Project Wild workshop.

He suggested that the large size of his school also made it difficult to get everyone involved, since it was so hard to coordinate any kind of program.

Though the participants did not blame themselves for the situation with other teachers, they seemed discouraged that they could not change things. Most had made attempts to get other teachers on board. John remembered that the original design for the schoolyard habitat program at his school involved a committee of teachers. That lasted about two years, but people stopped coming to the meetings and he started

feeling a real lack of support. The situation had not improved, as teachers stopped coming to the parent-supported outside workdays as well. Betty attempted to help other teachers become more comfortable outside by working with their classes during her breaks, but she could not keep it up and teach her class too. Rachel also tried to give teachers ideas, but reflected, "it's hard to be a prophet in your own land." Others implied this same feeling. They made comments to teachers such as, "I'll do whatever I can to help you" and "anything you need let me know." Some set aside areas of the gardens for each grade level and encouraged other teachers to just take the kids out and feel that "positive feedback." But in their minds, not enough teachers were listening.

The participants wanted other teachers to take students outside because they thought this might be the only nature experience the children received. Patsy was concerned that if children did not have a grandmother in the country or a neighbor with a garden, they might never have these experiences. Rachel wanted every child to have the schoolyard nature experiences because without them, "they're never going to have that kind of appreciation, that kind of understanding." Others knew how much the students loved being outside, and they did not want the children to miss those opportunities. Linda pointed out that it was "easy to get the kids out there," but getting the teachers interested was another matter.

There were several suggestions given to remedy these problems with other teachers. Larry commented that attrition worked well, and at his school the principal did not hire new teachers who were unwilling to participate. Others advised having a program coordinator or parent work with those teachers who were uncomfortable. Getting someone from another school, an outsider, to provide ideas was also suggested. Betty thought it would be less threatening to teachers if they understood how easy it was to fit the outdoors into the curriculum:

> If you could have it where the teachers had time to get used to it and they knew exactly how they could fit it in and it's not separate....They think it's something in addition to everything else they have to do. They need to see, it's a *part of* everything we do. It's just *another way* to do the stuff we do.

Rachel's idea was to start with those teachers in the school who showed an interest, and then, "encourage, give them an opportunity to put them in a position where they feel very comfortable, very competent with it." She suggested that "the more people we can get involved in it, the more we'll be able to disseminate it."

Getting more people involved was also important because the participants wanted the program to be something beyond themselves. They wanted the school grounds programs to thrive and continue after they left. John was afraid the schoolyard gardens at his school would become the Memorial Gardens when he and Linda retired. Others made similar comments. The participants wanted other teachers to start feeling more ownership for the projects they started. Helping other teachers learn to use the schoolyard to teach nature studies, and to become a part of the "movement" was extremely important to the teachers in this study.

Management challenges. Several other difficulties in managing a schoolyard nature program were discussed by the teachers. These varied considerably from teacher to teacher, but some common themes were mentioned.

One area of concern was management of children on the school grounds, though most discussions included advice for other teachers. The participants did not consider management a major problem, but spoke of having to come up with new ways to handle classes once they went outside. If the students had never been outside for lessons, they were excited and it could be difficult the first time out. It took a few times for children to adjust to the idea that this was investigation time, not recess. Some teachers used a technique of treating the students as scientists, with real tools

and a sense of importance about what they were doing. This seemed to help the students differentiate between class time and recess.

A somewhat related challenge was the amount of time it took to plan and implement a hands-on nature study program. Without good planning, management could become a problem and according to Rachel, good planning took time:

> I think that you have to plan twice as much because you're going to have children going in all different directions and unless you have thought this through knowing, you know, what these groups are going to do...I think it's a good idea to have the children work in cooperative groups, and have a focus when they go out, that there's a reason. What is the purpose and have them be doing data collection. Not just to go out, you know, and it ends up a big recess. That's not the point of it. The point is to go out and really find information...if you want to do it as a detective kind of thing, often times we do that and that's a lot of fun. They *love* to be detectives and see how much information they can find. Or if it's the kind of thing, a game that they're playing and they need the information in order to solve or to work through a problem or whatever, you know, that kind of thing. But it *has* to be planned, and it takes a lot of planning.

Rachel said it was a lot of work to find appropriate activities for the children.

Another concern was the amount of time it took to do inquiry-type activities. Ann commented that it was hard to fit inquiry into a "neat little package" of 45 minutes. She struggled with having a rigid schedule and at the same time the flexibility to "grab" the teachable moments. Her latest concern was the amount of time state standards testing was taking from her schedule. She felt that the standards, a state sponsored framework of what students should know and be able to do by each grade level, were taking away some of her flexibility in planning. The increased pressure

came from state standards testing, designed to assess if students met the standards each year. Ann felt that learning to take the test and having to "keep on track" with state standards was turning into a "tremendous burden to good teaching." Other teachers, mostly those from Virginia, mentioned the difficulty of keeping up with state standards testing. A few implied that passing the test *had* become the curriculum. Though some teachers were more positive about connecting the state standards with their schoolyard programs, they still suggested it took more time.

Another challenge for the teachers involved maintenance of the schoolyard habitats. Keeping the area clean, free of weeds, and ready for activities took time and effort. The garden pond filters had to be cleaned regularly. Most teachers involved the students in some of this work, but it could get out of hand, especially in the summer. Family work days helped and the teachers were positive about the results, but even that took extra time to coordinate. One idea for the summer was to get families (parent(s) and child) to adopt the garden for extra care. The families signed-up at the end of the school year and during their week, they watered, weeded, filled birdfeeders, and picked vegetables and flowers as needed. These parent support programs seemed to work better for some schools than others. Larry commented that if he could change anything about his program, "it would be to find the funds to maintain what we've already established." It was not working at his school to get teachers, parents, or school maintenance staff to do this on a long-term basis. School maintenance crews tended to be more a problem than solution at some schools. Teachers told stories of crews mowing the whole garden or cutting down boxwoods that had been a great place to watch birds or find insects. Ann commented about the frustration of teachers not being asked about such activities: "The schoolyard has to be viewed as part of the curriculum. And if teachers have input developing the curriculum, they've *got* to have input on the schoolyard."

Though the teachers faced frustrations with continuing their programs, they did not seem deterred. They spoke of adding more areas, building amphitheaters, and new theme gardens. Rachel told of the "next phase" of putting in an apple orchard and continuing the trail around the school. The teachers spoke positively of future plans. The challenges were there, but they still had can-do attitudes. Susan, for example, commented about the difficulties:

> We've had a *lot* of roadblocks that we've had to either find a way to get around or get over. That sort of comes with the way we wanted to teach. And some of it's just the physical arrangement which we have to teach in. Some are some other restrictions like financial, having the staff that you want. It's a constant thing that we work with to try to improve and to try and make it more meaningful. There's been lots of complications, some we found solutions to and some we're still working on.

None of the teachers in this study let the roadblocks stop them. They all seemed to "find a way to get around or get over" them in matters concerning their schoolyard nature programs.

The participants were committed to making their programs work, even though there were difficulties with continuing the efforts. Getting and keeping other teachers involved was the most difficult roadblock. Other challenges included management of students outside, lack of time, and maintenance of the schoolyard habitats.

Summary of Action Efficacy Pertaining to Schoolyard Nature Programs

The third finding of this study was that teachers of schoolyard nature studies were motivated to take action concerning their programs and committed to continue their efforts, even in the face of difficulties. The comments of motivation and commitment made by the teachers suggested feelings of competence and strong beliefs

related to their efforts. They expressed pride in their work and confidence in their abilities to accomplish new goals. In the early stages of their efforts, the teachers took the initiative to go to workshops, such as Project Wild, and visit other schools for ideas. The teachers involved local businesses and parents in establishing the schoolyard habitats and wrote grants to find funding. Even when other teachers were not easy to involve, the participants kept trying to find ways to increase interest in the program. They had positive attitudes about overcoming hurdles and put forth the effort needed to provide quality programs. They were dedicated teachers who found rewards for their efforts from the positive reactions of children.

Chapter Summary

The participants of this study were motivated and committed teachers with firm beliefs about the benefits of schoolyard nature studies programs. They were outdoor enthusiasts who enjoyed sharing nature with students. Many personal experiences with nature laid the groundwork for their own appreciation for and understanding of nature. With nature experiences as the foundation, the participants developed beliefs about sharing nature with children. They believed that children needed discovery time in the outdoors and experiences that helped them connect with nature. They believed that it was important to help students feel appreciation and stewardship for the earth. They also valued the learning benefits of taking students outside on the school grounds to study nature in a close and real setting. These beliefs were associated with the teachers' own experiences with nature, their experiences with children on the school grounds, and their teaching experiences. The teachers' beliefs seemed to motivate them to take action in developing and maintaining their programs. The teachers were committed to their programs and worked to get support and find funding, even in the face of obstacles.

The conceptual model of quality teachers of schoolyard nature studies was introduced. The model reflects the influences on and beliefs of a teacher that affect her motivation and commitment to using the school grounds for nature studies. The model refers to the teacher's personal experiences with nature, beliefs relevant to using the school grounds for nature studies, and action efficacy pertaining to a schoolyard program.

CHAPTER FOUR

LOOKING FOR UNDERSTANDING:

INTERPRETATIONS AND RELATED LITERATURE

As I look back on fully seventy years of awareness and recall the moments of greatest happiness, they were for the most part moments when I lost myself all but completely in some instant of perfect harmony. In consciousness this was due not to me but to the not-me, of which I was scarcely more than the subject in the grammatical sense... In childhood and boyhood this ecstasy overtook me when I was happy out of doors. Was I five or six? Certainly not seven. It was a morning in early summer. A silver haze shimmered and trembled over the lime trees. The air was laden with their fragrance. The temperature was like a caress. I remember- I need not recall - that I climbed up a tree stump and felt suddenly immersed in Itness. I did not call it by that name. I had no need for words. It and I were one.

Bernard Berenson
Sketch for a Self-Portrait

Introduction

This chapter of the dissertation will further explore the findings of the study as represented by the model of Quality Teachers of Schoolyard Nature Studies. Related literature in support of the model as well as the theoretical framework of environmental cognition will be presented. Lastly, this chapter will suggest interpretive insights, illuminated through the words of the participants, the theoretical framework, and the related supporting literature.

Review of the Model

As previously stated, the purpose of this study was to gain understanding of the experiences of elementary teachers who used their school grounds to do nature studies. The goal was to understand how they came to use the school grounds to teach nature studies and what it meant to them. The teachers' stories suggested common

meanings related to use of the school grounds. The teachers described details of their teaching practices on the school grounds, but also reflected on their experiences with nature and how they came to believe what they did about teaching and learning. The findings led to a conceptual model of Quality Teachers of Schoolyard Nature Studies. A complete description of a quality teacher was presented in Chapter 3.

The model of Quality Teachers of Schoolyard Nature Studies has three components. The questions of how the teachers came to use the school grounds for nature studies and what it means to them are addressed through these three components. The first component reflects a teacher's past and present experiences with nature. The second component presents teacher beliefs relevant to using the school grounds for nature studies. The third component has to do with teacher action efficacy pertaining to the school grounds program. The three components of the model build upon one another to suggest the growth and sustainment of a Quality Teacher of Schoolyard Nature Studies. Figure 2 shows an illustration of the model.

The model of Quality Teachers of Schoolyard Nature Studies suggests a connection between personal experiences with nature and how teachers feel about and practice sharing nature with children. The participants appreciate nature from their own outdoor experiences and they want children to learn to appreciate nature through experiences on the school grounds. The participants understand nature from their personal experiences and they believe that children learn best from similar experiences. The environmental cognition framework of this study may address some aspects of the teachers' experiences with nature, as it pertains to comfort levels and cognition of natural settings (Kaplan & Kaplan, 1982). However, the model of Quality Teachers of Schoolyard Nature Studies goes beyond this framework to include teachers' beliefs about teaching and learning on the school grounds. These beliefs play a pivotal role in what the teachers do and how they organize their

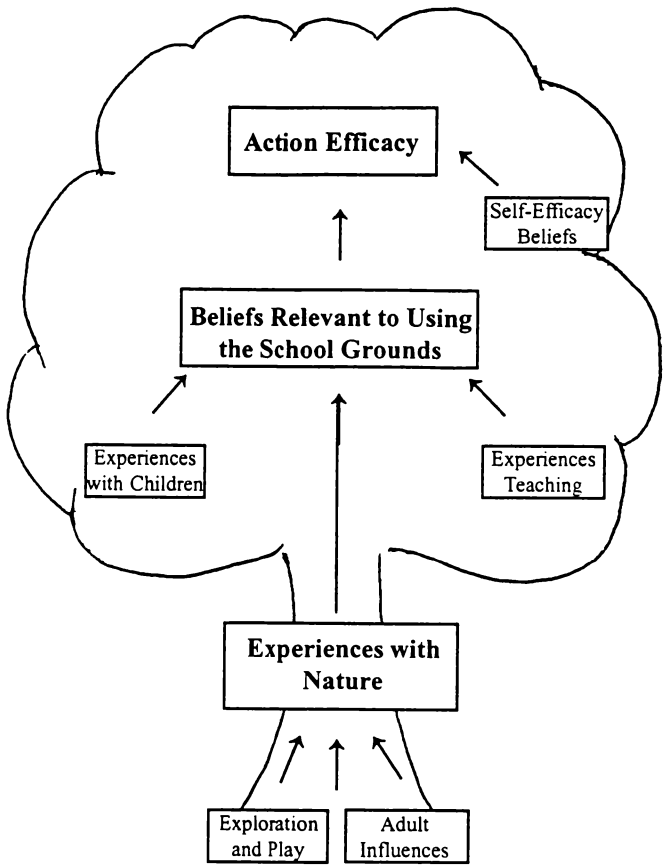

Figure 2. A Conceptual Model of Quality Teachers of Schoolyard Nature Studies (II)

thoughts (Richardson, 1996). The teachers in this study relate their beliefs through several dimensions of their life experiences. The model suggests that the action efficacy of teachers of schoolyard nature studies, i.e. action behavior displayed through motivation and commitment, is influenced by the teachers' beliefs.

In this chapter, literature will be introduced in support of the model. Interpretations will be organized through the three components of the Quality Teacher of Schoolyard Nature Studies model: 1) personal experiences with nature; 2) beliefs relevant to using the school grounds for nature studies; and 3) action efficacy of teachers of schoolyard nature programs.

Personal Experiences with Nature Component

The teachers in this study had a great deal of experience in the out-of-doors and these experiences affected them in profound ways. When they were young, the participants played outside "all the time" and were encouraged to learn more about nature by their parents and grandparents. As adults, they found spending time outdoors enjoyable and relaxing, and they were often drawn to natural locations. The teachers were definitely outdoor nature enthusiasts. These outdoor experiences gave the teachers an appreciation and understanding of nature. They learned about nature from their own experiences and from sharing nature with children.

The environmental cognition framework of the study supports the idea that spending time in a natural setting affects one's feelings about that setting (Kaplan & Kaplan, 1982). Based on the theory, the time spent outside as children, and perhaps as adults, may have increased the teachers' comfort with nature. During their outdoor experiences, the teachers developed cognitive maps or mental models of the explored environments. Their familiarity with the areas allowed them to function effectively. They could focus, make sense of what they perceived, and deal with complexities and unknowns. Because of the familiarity, they felt comfortable and confident about being outside (Kaplan & Kaplan).

Environmental cognition explains how people perceive and react to natural settings. Most of the teachers in this study seem to perceive their childhood natural environments as special places to play. As children, the teachers investigated nature with seemingly few restrictions, freely exploring the creeks, lakes, and woods of their youth. Their childhood stories suggest that they experienced a kind of self-directed joyful learning through their play experiences. Edith Cobb (1977) writes that "for every child all the world is new, and freshness of sensory experience abounds" (p. 48). In fact, children's outdoor play is a developmental phenomenon according to

many researchers in the field of early childhood education (Cobb; Davies, 1996; Hart, 1978; Moore, 1986; Rivkin, 1995). Observations of the constructive and creative play of children reveal "quite clearly that self-knowledge and a sense of identity are achieved only by means of interplay between the organism and it's total environment and that all 'knowing' emerges progressively at each level of organization, from tactile systems and functional relations with environment on up to semantic meaning and language systems," our basic way of organizing the world (Cobb, p. 56). The "knowing" that emerges from outside play relates to how the child sees herself as a part of time and space and therefore, as a part of nature (Cobb). "Children who are close to nature tend to relate to it as a source of wonder, joy, and awe" (R.A.Wilson, 1996, p. 1). They are able to take in nature and feel it in a "visceral, merged way" (Turner, 1999, p.30). In addition, they develop emotional attachments to natural settings that are familiar and comfortable to them (R.A.Wilson, 1996).

The culture of a teacher's upbringing may also affect how she 'knows' herself as a part of nature (Cobb, 1977). It may be naive to think that all children learn to care for nature simply because they spend time outdoors. But in a culture of adults who care for nature, children are likely to develop similar feelings (Turner, 1999). In an interview with Turner, Hart states:

> ...there's a period of time when children, as long as they have nature around them and if they have a caring adult who has a certain kind of stewardlike relationship to the land, not teaching them but demonstrating: if you have that kind of nondirective mentor close at hand, you're in really good shape for developing a close relationship with the natural world (p.30).

Having a role model may make the difference between a child simply feeling comfortable outside and one who learns to care about nature. The teachers in this study did have adults who acted as role models by encouraging them to be outside and

to learn about nature. For half of the teachers, grandparents shared details about plants and animals, and encouraged them to appreciate nature. In addition, the teachers' frequent positive experiences outside playing helped them develop feelings of connectedness to nature. Their comments suggest that the experiences instilled not only appreciation for the settings of their childhoods, but also affected their "life-long attitudes, values, and patterns of behavior toward natural environments" (R.A.Wilson, 1996, p.1). The teachers continued to spend time in natural settings as adults. They had feelings of connectedness and they cared about the environment.

A field of research called "Significant Life Experiences" suggests that childhood experiences with nature affect adult levels of concern for the environment. In numerous studies of the lifetime influences on people in environmental fields, positive childhood experiences in natural areas and adult role models recur as the primary sources of environmental interest and commitment (Chawla, 1998). A study specific to environmental educators suggests that childhood experiences in nature are the major influence for development of concern for the environment (Palmer, 1993; Palmer & Suggate, 1996). Having the influence of "family and other adults in awakening and fostering such interest" is also a major factor affecting concern (Palmer & Suggate, p.119).

A group of elementary teachers (n=23) completed the Survey of Antecedent Science-Related Experiences as part of a study (Ramey-Gassert, Shroyer, & Staver, 1996). On the survey, several teachers who said they had always been interested in science attributed it to parents, particularly fathers, who sparked their interests. Of the teachers who had always *enjoyed* science, a majority grew up in rural settings or in areas where they could regularly explore the natural world. "They stated that growing up on a farm or ranch allowed them to see connections between science and what they experienced daily" (Ramey-Gassert et al., p. 291). The comments were similar to

those of the teachers in my study.

If children do not spend time outdoors, does it reduce their positive feelings about nature? One study suggests that urban children with little experience in wildland areas are not comfortable when visiting natural settings (Bixler, Carlisle, Hammitt, & Floyd, 1994). Students in this situation "express a wide range of fearful responses to natural environments" (Bixler et al., p.31). The fear and anxiety they feel make it difficult for them to enjoy and to learn about nature. These negative feelings likely stem from their lack of familiarity with the natural settings. According to environmental cognition theory, when humans are unfamiliar with an environment, they are overwhelmed with new information to process. This leads to what Kaplan and Kaplan (1982) call cognitive chaos. In a wild, natural setting, an overload of information could be in the form of unrecognizable flora, fauna, sights, sounds, and smells. Uncertainty about what might happen in this unfamiliar place adds to the sense of confusion. It is uncomfortable and stressful, a situation humans typically avoid if possible (Kaplan & Kaplan). Children who have little experience in natural settings may continue to avoid these settings as adults.

Knowledge of nature may also be affected by lack of experience in natural settings. First graders from urban areas were asked to draw pictures of forests and discuss the types of living things found in them (Strommen, 1995). The children in the study showed a "general lack of awareness of plant life, insects, water resources, and other forest features" (Strommen, p. 683). Those children in the study who had visited a forest showed a modest increase in knowledge of plants and animals of the forest. Children from non-urban areas were not part of the study.

Botanical knowledge is higher for children who are frequently around vegetation. A study by Harvey (1990) suggests a relationship between children's experiences with vegetation and their botanical knowledge. Surveys were completed

by 8 to 11 year olds and their teachers at 21 schools in England. Information was collected about the children's past experiences with vegetation and about the school landscape, including plans of school grounds and vegetative inventories. The students in the study who "experienced much vegetation in their school landscape more frequently included the correct amount of vegetation in their cognitive maps... drew it at the approximate locations more often, and added the correct plant names" (Harvey, p. 12). Children with past experiences around vegetation also scored higher on the knowledge survey than children with limited experiences.

Research on the attitudes, knowledge, and behaviors of American children toward animals compared children from urban and rural areas, and there were significant differences between the two groups (Kellert, 1985). Children living in large cities had low scores on a knowledge of animals survey, while children living in rural areas had very high scores. In addition, children who participated in animal related clubs, birdwatched, or hunted were more appreciative, knowledgeable, and concerned about animals than those children who only learned about animals in school or at zoos. The results suggest "the positive value of direct, participatory contact between children and animals" (Kellert, p. 38).

According to Howard Gardner, outdoor experiences in natural settings may aid in the development of naturalist intelligence, one of the eight intelligences in Gardner's theory of multiple intelligences (Checkley, 1997; Gardner, 1999). Intelligence is a "biological and psychological potential... capable of being realized to a greater or lesser extent as a consequence of the experiential, cultural, and motivational factors that affect a person" (Gardner, 1995, p. 202). According to the theory, a person may develop a naturalistic intelligence from spending time interacting with and investigating the natural world (Armstrong, 2000; Meyer, 1998). Gardner describes naturalistic intelligence as the "ability to discriminate among living things

(plants, animals) as well as sensitivity to other features of the natural world (clouds, rock configurations)" (Checkley, p. 12). The turning points or "crystallizing experiences" in the development of naturalistic intelligence often occur in early childhood (Armstrong, p. 18).

Most of the participants learned about nature from their early experiences outdoors. They explored what they wanted to explore and studied nature in a free, autonomous state; it was their choice to be there. The real experiences provided a perfect setting for asking their own questions, with opportunities for seeking answers. Constructivist learning theory supports the idea that children (and adults) learn best under these conditions. Children learn by engaging themselves in the process, and "by constructing new understandings of relationships and phenomena in our world" (Brooks & Brooks, 1999, p.5). As children, the teachers came to understand the basics of how nature works by constructing their own knowledge about what they observed. The knowledge they constructed was not necessarily the information known by "experts" in the field of natural science; they had not refined the knowledge or reduced it to the order of science (Hawkins, 1990). But the direct experiences may have formed an important early stage in the development of nature literacy.

"Nature literacy is the ability to 'read' and comprehend, to the extent of one's capacity, all forms of life both as a reflection of an intelligible order and an interconnected aesthetic experience of life in its fullness" (Gilliam & Lane-Zucker, 1996 p.v). It involves a deep understanding of nature, knowledge based on personal and meaningful experiences, and a connectedness to what is learned. Nature literacy appears to describe the early knowledge constructed by the teachers in this study. The teachers often connected their love of nature with learning experiences such as observing living things, learning the names of flowers, and helping to plant the garden. Part of what made the experiences profound was that they were shared with

and encouraged by the people they loved and trusted such as their grandparents. The data also suggest that these profound experiences provided an understanding of nature and a desire to know more through life-long learning.

The teachers' learning experiences also included learning about nature with their students. The teachers explained the benefits of this for themselves and the students. They felt they did not have to be nature experts to teach science on the school grounds *if* they were willing to learn with the children. In addition, they believed it was better for student learning and more exciting for all if they worked to find answers together. Trumbull (1990) agrees that teachers do not have to be science experts to teach science. She writes:

> Science, as done now, is so specialized that the expertise of any accomplished scientist is quite limited. It is impossible to be a science expert in more than a few areas. Once out of their specialization, most scientists themselves work with everyday notions that would not be acceptable to experts in that field. If scientists cannot be general experts, teachers and teacher educators should not expect to be experts in the subject matter (p. 13).

On the other hand, Trumbull suggests teachers should be researchers in their own classrooms. They should investigate phenomena with their students and learn with them, and they should also research the "processes of investigation going on in the classrooms" to improve classroom practice (Trumbull, p. 19). Hawkins (1990) writes that even those elementary teachers who are "scientifically naive" can "attract and support children's investigative curiosity" (p. 113). He suggests that we need to re-introduce the "investigative and playful spirit of science" and that teachers can broaden their own understanding by learning in this way with their students (Hawkins, p. 138). Though Hawkins hopes that elementary teachers will learn science at "adult levels of understanding," he does not suggest they need to become experts (p. 122).

Summary of Personal Experiences with Nature Component

Environmental cognition theory suggests that when people spend time in natural environments, they develop cognitive maps of those settings (Kaplan & Kaplan, 1982). They become comfortable and confident about being there. Children who play in natural settings come to know themselves as part of nature and develop emotional attachments to nature (Cobb, 1977). Adult role models help instill a sense of appreciation and caring for nature (Turner, 1999). Studies of significant life experiences suggest that childhood time spent in nature and adult role models impact environmental educators' concern for the environment (Chawla, 1998). Studies suggest that urban children who have little contact with wild areas show fear and discomfort with natural settings and tend to have little knowledge of forest plants and animals (Bixler et al., 1994; Strommen, 1995). Outdoor experiences in nature may increase naturalist intelligence and nature literacy (Gardner, 1999; Gilliam & Lane-Zucker, 1996).

The teachers in this study played in natural settings as children and gained feelings of appreciation and care for these areas. Outdoor play helped them learn about nature and they came to appreciate nature with the support of adult role models. They continued to spend time in nature as adults. The teachers developed nature literacy, an understanding of nature based on their personal experiences and feelings of connectedness to what they learned (Gilliam & Lane-Zucker, 1996). Though the teachers did not consider themselves experts, their outdoor experiences provided a foundation for teaching children about nature. They believed it was okay, even beneficial, to learn with the children.

Beliefs Relevant to Using the School Grounds for Nature Studies Component

The teachers in this study expressed strong beliefs about their programs and

the benefits of schoolyard nature studies to children. They believed their students needed more discovery time outside, and being outside in nature instilled a sense of appreciation and connection to the earth, leading to stewardship. They believed their students learned best by doing and that the school grounds provided a real and relevant setting for active learning. The teachers also thought that students really enjoyed being outside and this increased the joy of learning for all.

Beliefs are the personal convictions or propositions about the world that are felt to be true by the individual holding the belief (Pajares, 1992; Richardson, 1996). Research suggests that teachers' beliefs about teaching and learning are formed early and may be well-established by the time they begin college (Pajares). Teachers' beliefs come from their personal experiences, their school experiences, and their experiences with formal knowledge (Mellado, 1998; Richardson). Because of the influence of beliefs on behavior, much can be learned from analyzing the beliefs of teachers (Lumpe, Haney, & Czerniak, 2000; Pajares).

Research on teachers' beliefs shows a "strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices" (Pajares, 1992, p. 326). Teachers develop certain skills and a knowledge of teaching from the practice of teaching and from taking courses, reading, or other professional activities (Van Driel et al., 2001). Beliefs play a role in the building of this "practical knowledge," since beliefs are the "filter through which new knowledge is interpreted" (Van Driel et al., p. 142). At the same time, a teacher's practical knowledge may influence her beliefs, e.g. she may come to believe some practices work better than others based on her experiences with students (Van Driel et al.).

Constructivist theory suggests that "each of us makes sense of our world by synthesizing new experiences into what we have previously come to understand (Brooks & Brooks, 1999, p. 4). In discussing their beliefs relevant to using the

school grounds for nature studies, the teachers in this study referred to several dimensions of their lives: 1) their experiences with nature, 2) their experiences teaching, and 3) their experiences with children on the school grounds. Their beliefs about schoolyard nature studies seemed to involve a complex construction of meaning involving these three dimensions.

Experiences with nature. The data suggest a relationship between the teachers' own nature experiences and their beliefs about the importance of nature experiences for children. The teachers had outdoor experiences and memories of learning about nature, and they wanted similar experiences for their students. They developed appreciation from their real experiences outdoors, and they wanted students to do the same. They could relate to the experiences of students doing nature studies, perhaps because of their own experiences with nature. The teachers' beliefs about the importance of nature experiences were consistent with the ideas of researchers in fields related to outdoor education.

Rivkin (1995) suggests that children do not play outside as much as they once did. She asserts the reasons are: lack of places to play, pollution of natural areas, risks from sun exposure and air pollution, traffic dangers, television, computer games, and busy schedules. She states that "children's access to outdoor play has evaporated like water in sunshine" and it has happened so fast no one has coped with the problem (Rivkin, p. 2). Rivkin calls for restoring children's right to play outside and asks teachers to work at improving the outdoor experiences of children.

Hart, co-director of the Children's Environments Research Group, also believes that children need to spend more time outdoors (Hart, 1993; Hart, 1999; Turner, 1999). He wants children to have direct and meaningful experiences with nature on a daily basis so they will get back in touch with nature and understand that it

is worth treasuring. In the 1970s, Hart (1978) conducted a study to describe children's relationship to their physical environments or what he called "the geography of place." He wanted to understand where children spent time and how they behaved in natural settings. He found, among other things, that children in a rural New England town had favorite natural places and a knowledge of the places (Hart, 1978). They understood how nature worked there, and they expressed a connection to nature. Hart believes that today's children do not have as much freedom and time to explore, understand, and connect with nature (Turner). He states that in order for children to understand the complexity of natural systems, they need a "chance to observe one ecosystem daily, richly, from different perspectives, and have opportunity to care for it and see the effect of one's caring" (Turner, p. 30). Hart supports learning on the school grounds through children's gardening as a way to achieve this (Hart, 1993; Hart, 1999; Turner). He addresses why it simply makes sense for children to study ecology just outside the school building:

> The only way somebody can understand ecology properly is to do it in place. Ironically, field trips are inappropriate. You can't go to another place for a day or half-day, come back and then another day go to another place. They can only start to intuit what an ecosystem is at that age, by seeing and experiencing its complexity from lots of different perspectives and different seasons, with different animals and living things, and with themselves as one of those interactive elements, too - having a chance to observe how they affect it and it affects them (Turner, p. 30).

In addition, Hart (1999) sees children's participation in the planning and management of the areas as a critical basis for someday participating in a democracy and trying to solve the world's environmental problems.

The teachers in this study hoped their students would care about the earth and

its living things. They wanted their students to understand and appreciate nature and to connect with nature in a personal way. They believed these things would occur, as it did for them, if they took students outside to do nature studies. The teachers did not emphasize the world's environmental problems as a way to get students to care about the planet. They simply wanted students to have experiences observing and learning about nature, and they believed appreciation and stewardship would follow.

There are a number of experts who agree with the teachers' premise. R.A. Wilson (1993) writes that children learn about living things and the "fragility of some plants, animals, and habitats" when they are involved with them (p. 19). She suggests that taking care of plants and animals teaches children about gentleness and caring for living things. Moore (1995) also believes that children's daily, direct contact with nature, such as through schoolyard gardening, is important. He writes that gardening is one of "the most direct means through which people of all ages can acquire an awareness of themselves as part of the Earth's life support system" (Moore, 1995, pp. 230-231). Hart (1999) also suggests that regular contact with nature is essential for stewardship:

> We should feed children's natural desire to contact nature's diversity with free access to an area of limited size over an extended period of time, for it is only by intimately knowing the wonder of nature's complexity in a particular place that one can fully appreciate the immense beauty of the planet as a whole (p. 192).

Educator and writer Sobel (1996) not only believes it is critical to take children outside, he suggests that this is the only way to truly nurture love and concern for the earth. He writes that the "green curriculum" of many classrooms such as teachers pushing the practice of recycling or decrying the cutting of trees in the rainforest does more harm than good (Sobel). He calls the resulting fears of ecological problems these

efforts instill, "ecophobia," and believes that young children (kindergarten through fourth grade) should not be exposed to horror stories of the environment. Sobel writes:

> What's important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds....Our problem is that we are trying to invoke knowledge, and responsibility, before we have allowed a loving relationship to flourish (p. 10).

Sobel notes that teachers may want to share ideas of socio-environmental responsibilities with older students, but only after many positive childhood experiences with nature.

Taking students outside on the school grounds for nature studies was one way for the teachers to act on their personal concern for the environment. Their comments suggested that they agreed with Sobel about "reclaiming the heart in nature education" by taking students outdoors to study nature (Sobel, 1996). The teachers believed that students would learn to appreciate and protect the earth as they did, through experiences with nature. Their playful childhood nature experiences helped them feel a connectedness to the nature. For some, grandparents and parents acted as role models to help them better appreciate nature. The teachers came to believe that children needed nature experiences. They became the role models in a cycle of learning about the environment.

Experiences teaching. The data suggests a relationship between the teaching experiences of the participants and their beliefs about schoolyard nature studies programs. The teachers believed their programs worked because of what they 'knew' from their experiences teaching, i.e. their practical knowledge. They believed that

hands-on, inquiry-based activities on the school grounds were effective for student learning. They believed that it was important to get student input, to involve them in the planning, and for student questions to guide investigations. They also believed that integration of subjects helped students better understand the concepts.

The participants' beliefs about how students learn on the school grounds were suggested by their instructional methods and professional practices. Some eluded to a philosophy of education that fit with what they did on the school grounds. For example, Larry commented that using experiential learning techniques in the schoolyard matched his philosophy of learning. The instructional practices used by the participants are clearly supported by the latest research and reform efforts in education. Recent research on intelligence (Armstrong, 2000) and brain research, i.e. how children learn (Abbott & Ryan, 1999; Jenson, 1998) supports these methods. Constructivist learning theory also suggests the use of these methods by teachers (Brooks and Brooks, 1999).

In science education, the constructivist perspective "recognizes that science knowledge is not something the teacher possesses and transfers to children; rather, students construct science knowledge (as do teachers and scientists) to make sense of their interactions with their world and with other learners" (Dana, Campbell, & Lunetta, 1997, p. 423). Constructivists believe that in the process of learning, children take in information through their senses, organize the information with existing knowledge, beliefs, or memories, adapt the information or the existing knowledge, and construct their own understandings (Piaget, 1971). Children build knowledge piece by piece, breaking down and reconstructing ideas as they learn (Bybee, 1999). Though the teachers in this study did not use the term 'constructivist,' the data suggest that they shared a perspective of constructivism. They implied that knowledge was constructed by the learner and that a teacher could not "make" this

process happen. Rather, the role of the teacher was to facilitate learning by structuring a learning environment that promoted understanding. In addition, the participants supported an environment where children used inquiry and were active participants in the learning process. It was apparent from the participants' comments that they were constructivist teachers.

Constructivist teachers take on the role of facilitator and are involved in the learning process with their students. Because of this, students may get more involved in the scientific process (Crawford, Kelly, & Brown, 2000). A study of student engagement in scientific practices found that when the teacher acted as a fellow investigator and made statements such as "I don't get it" or "I can't figure this one out," the students engaged in a discourse process of question asking and decision making related to the investigation (Crawford et. al.). The co-investigative role of the teacher fostered the discourse actions of the students. In the Crawford et al. study, the fourth/fifth grade elementary teacher "relinquished the typical teacher role as 'an authority' and shared the role of being 'in authority' by taking a more facilitative role, situating students as scientists and spokespersons in and for the class" (Crawford et. al., p. 253). In addition, the teacher modeled that what students had to say was important and worth listening to, and that weighing the contributions of others when making decisions was a viable scientific practice (Crawford et. al., p. 253). "Although the teacher lacked subject-matter knowledge specific to scientific issues, she was able to provide opportunities for scientific inquiry, define interesting roles for herself as a teacher in science discussions, and promote discourse processes that came to define science in open and creative ways" (Crawford et. al., p. 252). The authors were not arguing against the importance of teacher knowledge of science, rather they were emphasizing the idea that specific teaching strategies of discourse can help teachers present science as a process and model the practice of science.

Constructivist teachers get student input and determine what students know as a part of instructional planning. When teachers place importance on eliciting student ideas, the students also perceive their ideas as important (Akerson & Flick, 1999). In a study of children's ideas in science, researchers collected data in the forms of lessons taught, lesson plans, and interviews with three elementary teachers who elicited children's ideas (Akerson & Flick). Interviews with students and examples of student work were also collected. Analysis of the data suggested that the teachers did "plan activities in advance to help them understand students' conceptions" and the teachers were "aware of and attended to student ideas" (Akerson & Flick, p. 37). Though it was not apparent that the teachers used the information gathered for future instruction, the students believed the teachers valued their ideas. The results of the study implied that "if elementary teachers are aware of student ideas and elicit them, students may be more aware of their own ideas and the role they play in learning science" (Akerson & Flick, p. 49).

Constructivist teachers use inquiry-based learning approaches in an integrated curriculum. The Science Standards suggest that student understanding and ability in science are grounded in the experience of inquiry (NRC, 1996). Practicing elementary teachers use terms such as 'doing science,' hands-on science, and real-world science as descriptors of inquiry-based science instruction (Crawford, 2000, p. 918). Even if elementary teachers are not well-prepared in the knowledge and instruction of science, their basic skills in science coupled with strengths in language arts and reading instruction may help teachers provide a good inquiry-based science program (Flick, 1995). A descriptive study of the science instruction of a fourth-grade teacher analyzed the teacher's "application of discussion and questioning skills, her effectiveness in integrating portions of her language arts curriculum, her use of community resources, and her integration of hands-on activities to guide high-quality

learning in a science area in which she had only rudimentary knowledge" (Flick, p. 1069). The teacher's skills of discourse and the integration of language arts helped students express ideas and debate issues relevant to their investigations, an important aspect of inquiry. The teacher's efforts to bring in scientists and use hands-on activities provided opportunities for classroom discussion of science concepts. In addition, her instruction "recontextualized diverse student thinking in terms of broad concepts," such as when the students "speculated in depth on the effect of an exploding sun" and "how day and night would look on a flat earth" (Flick, p. 1080). Flick noted that elementary teachers, though perhaps lacking in scientific knowledge, may have other important skills for inquiry-based learning that should be acknowledged by reformers.

The participants developed a practical knowledge of school grounds nature studies, i.e. experience-based skills and knowledge of what works and how students learn. They used constructivist methods with students because they came to understand that learning occurred when they taught this way. Their teaching experiences (influenced by their nature experiences), provided a basis for their constructivist beliefs about instruction on school grounds.

Experiences with children on the school grounds. The data suggests a relationship between the teachers' experiences with children on the school grounds and their beliefs about the benefits of such programs for children. They observed students doing nature studies on the school grounds and they saw the excitement of joyful learning. The teachers' experiences with children led them to believe that "nature was a kid grabber," that students found the activities real and relevant, and that learning occurred on the school grounds.

The benefits referred to by the participants are similar to those discussed in a

nationwide study by the State Education and Environment Roundtable (SEER). SEER, a group consisting of representatives from 12 state education agencies, conducted case studies of 40 schools (K-12) across the United States that have adopted the concepts and framework of EIC, Environment as an Integrating Context for Learning (Lieberman & Hoody, 1998). EIC-based learning pertains to "using the school's surroundings and community as a framework within which students can construct their own learning" (Lieberman & Hoody, p. 7). The goal of an EIC program is to use the environment as a focus for all areas of learning: "general and disciplinary knowledge; thinking and problem-solving skills; basic life skills, such as cooperation and interpersonal communications;...and understanding of and appreciation for the environment" (Lieberman & Hoody, p. 7). EIC promotes the use of best practices such as interdisciplinary learning, student-centered and hands-on experiences, team-teaching, and individualized instruction. Though the study includes the use of natural areas in the community as well as the school grounds, the concepts pertaining to EIC and the SEER study findings clearly relate to the findings of my study.

Using both qualitative and quantitative data, the SEER study suggests that students who participate in an EIC program perform better on standardized tests and make higher grades than students in more traditional programs (Lieberman & Hoody, 1998). Students who are active in an EIC program show academic achievement improvements in reading, writing, math, science, and social studies. In addition, they tend to present more enthusiasm and self-motivation for learning and have better attendance at school, all of which may contribute to the improved scores. Educators from EIC schools report that students who have more freedom to explore their surroundings and ask their own questions develop higher-level thinking skills. In addition, students who collaborate while working on problem solving and project-

based EIC activities tend to get along better and develop stronger communication skills (Lieberman & Hoody). Teachers in the SEER study also report a renewed enthusiasm for teaching and "feel deeply rewarded as they see students, some for the first time ever, respond enthusiastically to what they are learning" (Lieberman & Hoody, p. 71). The teachers in the SEER study suggest that using EIC approaches motivates them to explore and implement new teaching techniques.

Another recent study by the Boston Schoolyard Funders Collaborative and the Education Development Center, Inc. (2000) also relates to the findings of my study. Research data from a survey of over 100 active school grounds programs suggests that schoolyard learning programs have a positive impact on academic learning and child development. Specifically, educators report that schoolyard learning environments stimulate improved teaching and learning, and that schoolyard learning activities foster greater environmental awareness (Boston Schoolyard Funders Collaborative et al.). Educators in the study suggest other benefits such as student pride and motivation, connection to surroundings and thus to learning, development of life skills, and stewardship of the earth (Boston Schoolyard Funders Collaborative et al.). In discussing the benefits, one teacher in the study comments that "many of our children rarely have had a chance to actually participate in designing, planting or nurturing plant life. Their excitement comes through in their writing, their desire to find out more, and their sharing of the things that they are learning" (Boston Schoolyard Funders Collaborative et al., p. 38). Another teacher states, "the greatest benefit has got to be the sparkle in students eyes when they're working in the garden" (Boston Schoolyard Funders Collaborative et al., p. 38).

The findings from the Boston Schoolyard study and the SEER study are for the most part based on teachers' comments and survey answers pertaining to the benefits to students. The similarity between some of the quotes from teachers in these

studies and the participants of my study are striking. The Boston Schoolyard Study and the SEER study involve many teachers in the research, from rural schools to inner city programs. It is interesting that teachers from so many different school settings observe similar benefits of using the schoolyard for learning.

A study supported by Learning Through Landscapes suggests a positive relationship between the conditions of the school grounds and students' attitudes and behaviors (Titman, 1994). Using a qualitative approach, Titman suggests that the way the school grounds are designed and maintained presents a "Hidden Curriculum" or unspoken message to the students. Children are aware of the conditions and see the school grounds as an extension of school. If the school grounds are well-designed and cared-for, and if children's opinions are considered in the design and management of the school grounds, it influences their outlook on school. This and other Learning Through Landscapes studies have led the organization to advocate better school ground design and management through government influence and professional development initiatives (Lucas, 1995). A goal of Learning Through Landscapes is to support and encourage teachers "to teach outdoors and to have the confidence to develop their own sites" on the school grounds (Lucas, p. 241).

Moore (1995) worked with Dr. Herb Wong on a ten year project in the 70's and 80's to convert an asphalt-rich, manicured schoolyard into a more natural environment. As principal of the primary school at the time, Dr. Wong's goal was to develop an interdisciplinary environmental curriculum to take advantage of children's natural interest in exploring the outdoors. Observed benefits of the program included motivation of the children, development of skills in growing and preparing food, and community participation. Another interesting discovery of the project was that gardening provided an easy way for teachers to initiate the interdisciplinary pedagogical approach. They found that "gardening made the easiest, most direct

connection between indoor and outdoor learning" and "it also provided a wider range of teaching/learning styles than the rigid four walls of the classroom" (Moore, 1995, p. 224). Teachers were attracted to the "pedagogy of gardening" because the activities gave "opportunities to connect individual personality, aesthetic expression, culture, and geography more closely than in other areas of the curriculum" (Moore, 1995, p. 230). The teachers seemed motivated by the gardening program as it was "the most popular component with the teachers and the one aspect of the environmental education program that survived over the years" (Moore, 1995, p. 222).

As previously mentioned, the teachers in my study seemed motivated by their observations of children doing schoolyard nature studies. Just as the teachers in other studies, they found it fulfilling when children showed so much enthusiasm for the activities or showed signs of learning and growth. They told stories of students who were so excited about school garden activities they did not want to go home or to recess. They shared specific examples of the children's caring and compassion for living things. The teachers' observations of students seemed critical to their beliefs that schoolyard programs benefit children.

Summary of Beliefs Relevant to Using the School Grounds for Nature Studies Component

Teachers beliefs about schoolyard nature studies develop over time and are "prioritized according to their connections or relationship to other beliefs or other cognitive and affective structures" (Pajares, 1992, p. 325). The complex construction of teachers' beliefs begin early in life and play a key role in their interpretation of knowledge and thought processes (Pajares). Their beliefs influence the educational decisions they make, as well as their teaching behavior (Lumpe et al, 2000).

The participants discussed their beliefs about using the school grounds for

nature studies using three dimensions of their lives: experiences with nature, experiences teaching, and experiences with students on the school grounds. A picture of the teachers' beliefs can be developed through a lens that connects these dimensions (See Figure 3). This picture of the teachers' beliefs is derived from the data and presented with support from the literature.

The teachers had many nature experiences where they learned to appreciate and understand nature. They developed a set of beliefs about how children learn about nature and the importance of sharing nature with children. Research suggests that teachers' beliefs about how students learn and what they should learn have the greatest impact on which curriculum is implemented (Tobin, Tippins, & Gallard, 1994). The

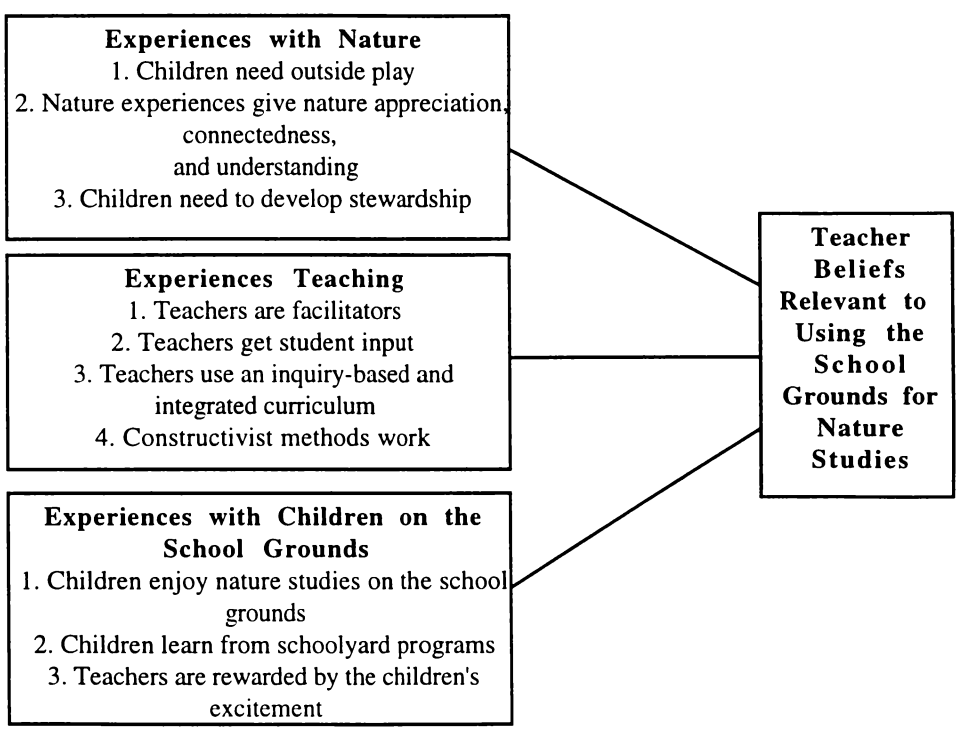

Figure 3: Dimensions of Teacher Beliefs Relevant to Using the School Grounds for Nature Studies

teachers used constructivist methods with their students on the school grounds, encouraging investigation and student involvement. The methods they used were similar to the experiential way they learned about nature. Research suggests that teachers often teach the way they learned (Tobin et.al.). The teachers developed a practical knowledge of teaching on the school grounds, based on their teaching experiences and their beliefs about how children learn. While using constructivist methods, they observed students experiencing the school grounds nature activities. The students seemed to enjoy the learning process and to learn from these real experiences. The teachers could relate to the children's experiences with nature. They came to believe that real experiences with nature on the school grounds were an effective way for students to learn.

Action Efficacy of Teachers of Schoolyard Nature Programs Component

The participants successfully faced the challenges of starting-up and continuing to use the school grounds for nature studies. They worked at getting information from other schoolyard programs and took workshops for ideas. They found resources for funding and support from businesses and parents. They enjoyed what they were doing and were excited about the joyful learning and participation of students. The teachers did not allow obstacles to keep them from achieving their goals; in fact, they seemed quite confident about their abilities to overcome any roadblocks. They were frustrated that more teachers were not involved in the programs, so they worked at getting them involved. The school grounds program took more time and effort to plan, implement, and maintain than a classroom program, but this was not used as an excuse for backing out. Instead, the teachers did what they needed to do to make their programs work.

Action efficacy refers to the action-oriented behavior of teachers, reflected by

their motivation and commitment. The action efficacy of the participants was strongly influenced by two aspects of their belief systems: 1) the teachers' beliefs about their programs, and 2) their self-efficacy beliefs, i.e. personal judgements of competence (Bandura, 1997). Beliefs in what they were doing and the benefits to students seemed to motivate the teachers to action. Also, they presented strong feelings of confidence about accomplishing their goals. Lumpe et al. (2000) argue that teachers' beliefs are "powerful motivation agents that lead to action agendas. Therefore, if teachers believe something to be true, then they are likely to act (or not) accordingly" (p. 287).

The participants of my study believed strongly in what they were doing, took the initiative to start the schoolyard programs, and found the necessary funding to accomplish their goals. They were motivated to work at taking students outside for nature studies and were rewarded by what they observed. Their motivation was sustained because they found working with the students on the school grounds "fulfilling." Motivation is defined as "the process whereby goal-directed behavior is instigated and sustained" (Schunk, 1991, p. 229). Motivation is inferred from people's comments, task choices, effort expenditure, and persistence; it is not directly observed (Schunk, 1991). Bandura (1997) states that human motivation is, for the most part, cognitively generated. People "form beliefs about what they can do, they anticipate likely positive and negative outcomes of different pursuits, and they set goals for themselves and plan courses of action designed to realize valued futures and avoid aversive ones. Efficacy beliefs play a central role in the cognitive regulation of motivation" (Bandura, 1997, p. 122).

Bandura (1997) writes that "teachers' beliefs in their efficacy affect their general orientation toward the educational process as well as their specific instructional activities" (p. 241). He defines self-efficacy as "people's judgements of their capabilities to organize and execute courses of action required to attain designated

types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391). Self-efficacy research suggests that people gain efficacy from successful experiences, performance accomplishments, suggestions from others, and comparisons to others (Schunk, 1989). In addition, self-efficacy may influence involvement or non-involvement in activities, i.e. people tend to avoid activities they do not think they can handle (Bandura, 1977). Judgements of personal efficacy influence not only what people do but also how much effort and time they devote to a task, especially when they are faced with difficulties (Lefrancois, 1995). "The stronger their perceived self-efficacy, the more vigorous and persistent are their efforts" (Bandura, 1986, p. 394). People with a high sense of efficacy are likely to seek a higher level of performance and to persist in the face of difficulties (Schunk, 1989). Bandura (1986) suggests that self-efficacy beliefs are the strongest predictors of human motivation and behavior.

Lumpe et al. (2000) argue that teachers' beliefs about science teaching involve both context beliefs and capacity beliefs. Capacity beliefs are "beliefs about one's ability or skill to meet a particular goal" (Lumpe et al., p. 277). Capacity beliefs compare with Banduras' (1986) concept of self-efficacy. "Context beliefs are beliefs about the responsiveness of the environment (external factors and or/people)" (Lumpe et al., p. 277). Context beliefs are sometimes called perceptions of control and for teachers encompass students, other teachers, administrators, parents, institutions, and the physical environment. In developing a method for assessing teachers' context beliefs, the researchers found interesting patterns pertaining to the teachers in their study. One finding was that the number of years of teaching experience was positively related to context belief. Lumpe et al. wrote that this was not surprising because "as teachers come to understand the school environment and bureaucracy, they find ways to make the system work" (p. 286). In addition, the study found that teachers who

showed tenacious patterns, i.e. strong capacity beliefs and neutral or variable context beliefs, were not easily defeated and were persistent in their goals (Lumpe et al., p. 287). The authors worried that teachers with this pattern, though strong-minded, might burn-out over time if they did not receive support from their environments.

The teachers in my study presented themselves as competent in their efforts to make the programs successful. They suggested little doubt in accomplishing their goals, even though they mentioned frustration with external factors such as other teachers and the standards. The efficacious comments of the participants showing motivation and commitment to their programs also suggest that they had a high sense of efficacy or strong capacity beliefs concerning their school grounds programs. Interestingly, students tend to learn more from teachers with a high sense of efficacy than from teachers full of self doubts (Bandura, 1997). Teachers with a high sense of efficacy tend to rely on "persuasory means rather that authoritarian control and to support development of their students' intrinsic interest and academic self-directedness" (Bandura, 1997, p. 241). In addition, high efficacy teachers tend to think that difficult students are teachable through extra effort and appropriate techniques (Bandura, 1997).

A study of the factors influencing science teaching self-efficacy examined elementary teachers' personal science teaching efficacy, i.e. beliefs in their ability to teach science, and their science teaching outcome expectancy, i.e. beliefs in student ability to learn science (Ramey-Gassert et al., 1996). Personal science teaching efficacy was influenced by two aspects of the teachers' lives: internal factors, such as desire for change, image of self, and memories of school experiences and external factors, such as resources, principals, and other teachers. Teachers with low personal science teaching efficacy had feelings of inadequacy about teaching science and perceived a lack of background in science. Teachers who had high personal science

teaching efficacy were independent and professionally active. They wanted to improve science teaching for students, other teachers, and for preservice teachers (Ramey-Gassert et al., p. 298). They showed strong beliefs in a "hands-on/minds-on, active, process skills approach to science teaching with very little or no reliance on the textbook" (Ramey-Gassert et al., p. 298). They also expressed a positive, task-oriented attitude.

Haney, Czerniak, and Lumpe (1996) studied the factors influencing teachers' intentions to implement the four strands of the State of Ohio's Science Model. In the study, structured interviews were conducted with 13 teachers to elicit their salient beliefs, i.e. beliefs that determine attitude (Haney et al., p. 977). The resulting data were used to develop questionnaires which were sent to a randomly selected sample of 800 teachers statewide. The study found that the salient belief most affecting implementation of the model was the belief that engaging in the behavior would lead to favorable outcomes. "The obstacles and enablers that the teachers were provided mattered less to them than did their beliefs about the positive and negative outcomes associated with the behavior" (Haney et.al, p. 985).

Cronin-Jones (1991) explored the influence of teacher beliefs on curriculum implementation. She found that when teachers' belief structures were incongruent with the underlying philosophy of the curriculum, it hampered successful implementation. Two middle level teachers were given a curriculum to follow (with materials and proposed teaching styles) and then researchers observed teaching sessions and interviewed the teachers. Interpretation of case studies indicated that four major categories of beliefs strongly influenced (in these cases hampered) the curriculum implementation process: 1) beliefs about how students learn, 2) beliefs about a teacher's role in the classroom, 3) beliefs regarding the ability levels of students in a particular group, and 4) beliefs about the relative importance of content

topics (Cronin-Jones, p. 246). The author stressed the importance of identifying and addressing teachers' beliefs as part of curriculum development and implementation.

The participants of my study showed commitment and faced the challenges of maintaining their programs. Some of the challenges mentioned were lack of time and involving other teachers in the schoolyard activities. The participants were motivated to address these issues, but their frustration was apparent. Examining these issues may aid in understanding the strength of their beliefs and help clarify the challenges they faced.

One challenge, the amount of time taken by standards testing, is covered in the research. Wood (1988) suggests that standards testing can have a negative impact on the amount of control teachers have over their programs. In analyzing the effectiveness of state-mandated standards testing on student scientific literacy, Wood finds that standards testing "constrains and routinizes the teachers' behavior, causing them to violate their own standards of good teaching. They feel pressured to 'get through' the materials so students will score well on tests" (p. 631). He writes that "teachers feel they have lost what they enjoyed most about teaching, a sense of inner satisfaction and control of their work" (Wood, p. 640). Evans (1996) agrees that "efforts to improve schools' accountability via statewide competency testing and curriculum mandates also dismay teachers, because they diminish their autonomy and deprofessionalize their work" (p. 83). Unfortunately, the best teachers are the ones who must change their teaching methods and schedules when they are required to "teach to the test" (Kohn, 2001; Thompson, 2001).

Another challenge for the participants was getting and keeping colleagues involved in the schoolyard programs. While some had colleagues who collaborated with them, most felt frustration at the lack of interest and commitment of other teachers. Research on teachers who are not motivated to take students outside

suggests a variety of reasons. Simmons (1998) describes the complex motivations of teachers to use various nature settings for environmental education. In her study, elementary teachers (n=59) were interviewed concerning the benefits and barriers to using natural settings. They completed a questionnaire related to photographs of a variety of outdoor settings. While the teachers felt that deep woods and water areas were more appropriate for environmental education than were urban areas and county parks, they expressed a need for more background and preparation for teaching in these areas. At the same time, they suggested that urban areas were the most difficult place to teach environmental education (Simmons, 1998). The teachers expressed concerns that they were not "particularly well trained to teach in natural areas" and noted a desire for more training before taking students outside (Simmons, 1998, p.31).

Tilgner (1990) suggests similar barriers to elementary science teaching; these barriers also impact outdoor nature programs. She writes that "not only do many elementary teachers not like science, many feel totally unprepared to do an adequate job teaching science" (Tilgner, p. 423). She attributes avoidance of science instruction to lack of science coursework, science anxiety, and lack of hands-on experience for elementary teachers. She suggests that elementary teachers need to have "realistic science experiences which help them develop the basic science skills" (Tilgner, p. 424).

Beliefs strongly affect behavior and beliefs drive action, but experiences and reflection on action may lead to changes in beliefs (Bandura, 1986; Tobin et al., 1994). Overcoming some of the barriers to outdoor learning may depend on teacher change in beliefs. Briscoe and Peters (1997) conducted a study of elementary science teacher change through collaboration with other teachers and university researchers. The selective sample of 24 teachers were chosen for their interest in teaching science

and their openness to changing classroom practices and working with others (Briscoe & Peters, p. 63). The researchers developed an understanding of the relationship between change and the collaborative process through interviews with the teachers, group meetings, observing lessons being taught, and reading lesson plans. Analysis of the data indicated that "collaboration facilitates change because it provides opportunities for teachers to learn both content and pedagogical knowledge from one another, encourages teachers to be risk takers in implementing new ideas, and supports and sustains the processes of individual change in science teaching" (Briscoe & Peters, p. 51).

Summary of Action Efficacy of Teachers of Schoolyard Nature Programs Component

The action-oriented behavior of the teachers in this study was evident from their comments reflecting motivation and commitment to their programs. They did what needed to be done to make their programs successful. They took workshops and found funding and support. Though there were some challenges, they remained committed to their goals of student learning on the school grounds. The action efficacy of the teachers was strongly influenced by their beliefs about the schoolyard programs and their self-efficacy beliefs.

The participants displayed a high sense of efficacy concerning their schoolyard programs. They presented themselves as competent and showed little doubt that students would enjoy and learn from their programs. Research suggests that high efficacy teachers tend to support student self-directedness and are not as authoritarian in their teaching approach (Bandura, 1997). In addition, teachers with high personal science teaching efficacy are independent, professionally active, have strong beliefs in hands-on/minds-on learning, and possess a positive, task-oriented attitude (Ramey-Gassert et al., 1996).

The participants had strong beliefs about their programs and were motivated to make them successful. They sustained their motivation through their observations of joyful student learning. Beliefs are "powerful motivation agents that lead to action agendas" (Lumpe et.al, 2000, p. 287). When teachers' beliefs are incongruent with the curriculum, it hampers successful implementation (Cronin-Jones, 1991). When teachers believe in the positive outcomes of their behavior, they are motivated to act accordingly (Haney et al., 1996; Lumpe et al.).

The participants showed commitment to their programs, even though there were challenges. Challenges such as lack of time due to standards testing and efforts to get other teachers involved were mentioned by the participants. Research suggests that teachers feel constrained by standards testing and pressured to cover the test material (Wood, 1988). Also, teachers who are not motivated to use the school grounds for nature studies tend to feel unprepared for such activities and desire more training (Simmons, 1998; Tilgner, 1990). Overcoming such barriers may require changes in beliefs (Bandura, 1986).

Chapter Summary

This chapter presented interpretations of the data and related literature in support of the conceptual model of Quality Teachers of Schoolyard Nature Studies. The three components of the model 1) personal experiences with nature, 2) beliefs relevant to using the school grounds for nature studies, and 3) action efficacy of teachers of schoolyard nature programs, were described and discussed in detail.

Because of their significant experiences with nature, the teachers in this study reported a unique understanding and appreciation for nature. Environmental cognition theory supports the idea that spending time in nature adds to comfort levels and cognition of natural settings (Kaplan & Kaplan, 1982). Outdoor play by children

increases their connectedness to nature, concern for nature, and adds to their knowledge of nature (Chawla, 1998; Cobb, 1977; Kellert, 1985; Strommen, 1995). Spending time outside aids in the development of naturalistic intelligence (Gardner, 1999) and nature literacy, an understanding of nature based on personal experience (Gilliam & Lane-Zucker, 1996). Teachers do not have to be science experts in order to effectively teach nature studies to children (Hawkins, 1990; Trumbull, 1990).

The participants developed beliefs about schoolyard nature studies from their experiences with nature, experiences teaching, and experiences with students on the school grounds. Teachers' beliefs play an important role in what they do in classroom practice (Pajares, 1992). The participants believed that sharing nature with children was important for stewardship development (Hart, 1999; Sobel, 1996) and that constructivists methods were effective for learning (Brooks & Brooks, 1999). Their stories of students enjoying the learning process on the school grounds compared to observations from other studies (Lieberman &Hoody, 1998). The participants came to believe that the schoolyard provided an effective setting for *real* learning.

The participants were action-oriented teachers who expressed confidence in their abilities to do nature studies on the school grounds with students. They were motivated and committed teachers who faced the challenges of starting and maintaining their programs. Their action-efficacy was influenced by self-efficacy beliefs (Bandura, 1997) and beliefs in their programs. Research suggests that beliefs are motivation agents leading teachers to take action (Lumpe et al., 2000). Teachers with a high sense of efficacy tend to allow students more autonomy, rely less on textbooks, and present positive, task-oriented attitudes (Bandura, 1997; Ramey-Gassert, 1996).

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

While we are born with curiosity and wonder and our early years
full of the adventure they bring,
I know such inherent joys are often lost.
I also know that, being deep within us,
their latent glow can be fanned to flame again
by awareness and an open mind.

Siguard Olson
Listening Point

Overview

The purpose of this qualitative study was to gain understanding of the experiences of elementary teachers who used the school grounds to do nature studies. The study was conducted with a purposeful sampling of quality public school teachers (K-5) who were well-known for their schoolyard nature studies programs. For the purposes of this study, a quality teacher was described as a teacher who conducts best practices in education as suggested by the *National Science Education Standards* (NRC, 1996) and the *Guidelines for the Initial Preparation of Environmental Educators* (NAAEE, 2000), e.g. they are involved in improving the profession; use hands-on, inquiry-based activities; and integrate the curriculum across disciplines.

The participants were selected from referrals by selected science education leaders in Tennessee and Virginia. Ten teachers from eight schools in Tennessee and Virginia participated. The study sought to understand how the teachers came to use the outdoors to teach and how they experienced teaching nature studies on the school grounds.

Two key research questions guided the study:

1. How do elementary teachers come to use the outdoors to teach nature studies?

2. How do elementary teachers experience teaching nature studies on the school grounds?

Semi-structured, open-ended interviews were conducted along with tours of the school grounds. Questions pertaining to the experiences, perceptions, and motivations of the teachers in natural settings, specifically school grounds, helped focus the study around the theoretical framework of environmental cognition. The environmental cognition framework related to the teachers' comfort levels and cognition of natural settings (Kaplan & Kaplan, 1982).

A conceptual model of Quality Teachers of Schoolyard Nature Studies has been delineated. It represents the dynamic elements of such a teacher's world. The model refers to the personal experiences and beliefs that help mold a teacher and her practice, and suggests a picture of how a teacher of schoolyard nature studies thinks and acts. The model refers to the personal and professional efforts taken to develop and sustain a schoolyard nature studies program and the motivational forces that lead these teachers to action. There are three components of the model. The first component reflects a teacher's past and present experiences with nature. The second component presents teacher beliefs relevant to using the school grounds for nature studies. The third component refers to teacher action efficacy pertaining to the school grounds program. The three components of the model build upon one another to suggest the growth and sustainment of a Quality Teacher of Schoolyard Nature Studies. Details of the model were presented in Chapter 4.

Summary of the Findings

The findings of the study were organized by the three components of the Quality Teachers of Schoolyard Nature Studies model and presented in Chapter 3. The

three components of the model were: 1) personal experiences with nature, 2) beliefs relevant to using the school grounds for nature studies, and 3) action efficacy of teachers of schoolyard nature studies. This section will present summaries of the findings and conclusions.

Personal Experiences with Nature

The first finding of the study referred to the many experiences the teachers had with nature. They played outside as children, learned about nature, and developed an appreciation for nature. The adults in their lives encouraged these experiences of nature learning and appreciation. The participants continued to spend time outside as adults. They developed a basic understanding of nature concepts from their personal experiences and from experiences on the school grounds with children. While they did not see themselves as nature experts, they felt they could effectively teach nature studies to children.

The teachers' experiences with nature affected them in profound ways. They noted that these experiences were a major influence of their interests in nature and feelings about nature. They also implied that they learned more about nature from their experiences than from coursework or textbooks; they learned enough to make them comfortable about sharing nature with children. This first finding suggests the importance of past nature experiences for teachers and compares to the findings of other studies (Palmer, 1993: Ramey-Gassert et al., 1996). It also suggests a connection between teachers' past experiences with nature and their comfort and interest in implementing a schoolyard nature studies program.

Beliefs Relevant to Using the School Grounds for Nature Studies

The second finding was that teachers of schoolyard nature studies had very

strong beliefs about the need for school grounds programs and the positive benefits of such programs. In discussing their beliefs, the teachers referred to several dimensions of their worlds: their own experiences with nature, their teaching experiences, and their experiences with children on the school grounds. The participants' beliefs or personal convictions about their schoolyard programs were based on a complex construction of meaning related to these three dimensions of their lives.

The teachers' many nature experiences influenced their beliefs about how children learn about nature and the importance of sharing nature with children. They used methods on the school grounds similar to the experiential way they learned about nature. They enjoyed learning about nature and they observed their students enjoying the learning process. This second finding of the study supports the idea that teachers teach the way they learned (Tobin et al., 1994) and that teachers' beliefs influence instructional decisions and classroom practice (Pajares, 1992).

Action Efficacy of Teachers of Schoolyard Nature Studies

The third finding was that teachers of schoolyard nature studies were motivated to take action concerning their programs and committed to continue their efforts, even in the face of difficulties. The action efficacy of the teachers was strongly influenced by: 1) their beliefs about the schoolyard programs, and 2) their self-efficacy beliefs. The teachers expressed pride in their work and confidence in their abilities to accomplish new goals. They took initiatives related to their programs, had positive, task-oriented attitudes about overcoming hurdles, and put forth the effort needed to provide schoolyard nature programs. They took on challenges such as involving other teachers and dealing with time constraints imposed by standards testing. They were dedicated teachers who found rewards for their efforts in the positive reactions of children.

The teachers' beliefs were "motivation agents" that lead them to take students outdoors to study nature (Lumpe et al., 2000). They believed students needed nature experiences, and they believed the school grounds provided such a setting for learning; therefore, they took action. In addition, the participants displayed high self-efficacy beliefs related to their schoolyard programs. They presented themselves as competent and capable of creating a schoolyard program where students would enjoy the process of learning about nature. This third finding of the study suggests the influence of teachers' beliefs on the implementation of a schoolyard nature studies programs. It compares to other studies on the relationship of beliefs to curriculum implementation (Cronin-Jones, 1991; Haney et al., 1996; Ramey-Gassert et al., 1996).

Implications for Research and Practice

Implications for Research

The preceding chapters and sections included information that warrants further study. This section will present ideas and suggestions for future research on the topic of teacher use of school grounds for nature studies.

1. The participants of this study learned to appreciate and care for nature from their early experiences with nature. Research has focused on the significant life experiences influencing environmentalists and educators in the field of environmental education (Chawla, 1998; Palmer, 1993; Palmer & Suggate, 1996). Future research could explore, in detail, the significant life experiences of quality teachers of school grounds nature studies.

2. This study suggests that the participants' experiences with nature influenced their beliefs on sharing nature with children, and these beliefs lead them to implement a

schoolyard nature program. Calls for research on teachers' beliefs and their impact on reform efforts are evident in current science education literature (Keys & Bryan, 2001; Lumpe et al., 2000). Further research on teachers' beliefs about nature studies with students needs to be conducted; the studies could explore the influences of teachers' beliefs on implementation of outdoor programs.

3. The participants in this study did not consider themselves nature experts, but they had a basic understanding of nature gained from their own experiences and they felt comfortable sharing nature with children. A number of studies and reports address the idea that elementary teachers do not have the knowledge or coursework needed to effectively teach science or environmental education (Simmons, 1999; Sutton, Watson, Parke, & Thomson, 1993; Tolman & Campbell, 1991; Weiss, 1987, 1993; Wilke, Peyton, & Hungerford, 1987). In addition, studies suggest that teachers avoid teaching science or environmental education because of too few courses and a perceived lack of knowledge (Berenson, Hodgin, Ward, Andrews, & Rudin, 1991; Simmons, 1999; Weiss, 1993). The findings of this study suggest a need for research on the influences of nature experiences on elementary teachers' understanding of nature concepts. Life-experiences and personal study may be factors influencing elementary teachers' knowledge of nature.

4. Most of the participants' mentioned workshops, e.g. Project Wild, that gave them ideas and helped motivate them to begin a schoolyard nature program. The *National Science Education Standards* (NRC, 1996) call for professional development practices in which teachers learn science in the same ways their students learn science, through inquiry. If nature experiences are a part of professional development, does it help teachers change their beliefs or practices? Research needs to be conducted on the effects of including nature experiences in elementary teacher preservice and/or inservice professional development.

5. The participants of this study believed there were many benefits of their schoolyard nature studies program. They noted the children's' joyful learning experiences and felt that school grounds provided a setting for real learning. The SEER study (Lieberman & Hoody, 1998) and the Boston Schoolyard study (Boston Schoolyard Funders Collaborative et al., 2000) had similar findings and gave some evidence of student learning on the school grounds. The findings from my study and the other studies suggest a need for additional research on the learning benefits of schoolyard nature programs.

6. The teachers in this study believed that schoolyard nature experiences would lead to stewardship for their students. Several researchers agreed and recommended nature activities instead of introducing major environmental problems to young children (Hart, 1999; Sobel,1996; Turner, 1999). A recent survey by the NAAEE and Environmental Literacy Council (2000) found that elementary teachers (K-4) relied heavily on environmental groups as suppliers of the materials they used to teach environmental education. More research is needed to study the stewardship benefits of schoolyard nature programs and the effects of introducing environmental problems to young children.

7. In conducting this study, the researcher listened to the teachers, recorded their stories, and then checked with them for accuracy and plausibility. Attempts were made to show respect for the teachers' ideas and beliefs, and to learn from them. The research was not done *to* teachers, but *with* them. When theory is developed by a researcher far removed from the classroom and teachers have little say in the data collected or the results, the "new knowledge" may not relate to them or their classrooms and as a result may not be applied. More research in education is needed where theory develops from listening to teachers, an inductive approach committed to understanding their perspectives, and then using the understandings to build theory.

Teachers feel more empowered, have ownership for findings, and we all learn more about improving the profession when teachers are respectfully involved in the research (Clark et al., 1996).

8. This study presented a conceptual model of quality teachers of schoolyard nature studies. In addition to providing a form for understanding such a teacher's world, the model may also be used as a framework for future research.

Implications for Practice

The findings of this study revealed ideas that have implications for educational practice. This section will present views and recommendations for practice.

1. The participants of this study were influenced by their own experiences with nature to provide schoolyard nature learning for students. This would suggest that elementary teachers need more experiences outdoors in natural areas as part of preservice coursework and professional development. College courses in the natural sciences, science education, math education, and social studies education may provide the best opportunities for outdoor experiences for preservice teachers. Taking preservice teachers on field trips to natural areas, on a weekend research outing, or asking them to volunteer at a nature or wildlife center are just a few ideas for getting future teachers outside. Inservice workshops could also be conducted in natural areas, and school grounds with nature studies programs may be a good place to start. Activities that encourage inquiry experiences with nature should be a major part of programs for either preservice or inservice elementary teachers, but allowing time for free exploration and "play" may also be necessary if the goals are to increase comfort levels and appreciation. Appendix F provides examples of such programs.

2. The idea that teachers "teach the way they learned" is supported by this and other studies (Tobin et al., 1994). The teachers in this study learned about nature from their

personal experiences outdoors and they used similar methods when teaching on the school grounds. With this in mind, school systems should adopt some of the Immersion into Inquiry strategies presented by the Eisenhower National Clearinghouse (2001) website (http://www.enc.org/professional/ideas/science). The "Ideas That Work" inquiry suggestion presented by the website is that teachers first need to be in the role of a scientist to really learn to do inquiry activities with students. Conducting investigations as adult learners may help teachers deepen their understanding of scientific concepts and the nature of science. Some of the teachers in my study worked closely with wildlife or horticulture professors or graduate students for help and support. Perhaps matching a reluctant teacher with local professionals would give a boost to their efforts on the school grounds. If teachers (as individuals) could go to natural areas with local researchers to help collect data, they may begin to understand the importance of doing similar activities with students.

3. Most of the participants mentioned finding ideas and motivation for beginning their schoolyard programs at workshops. Some of the workshops discussed were Project Wild, Project Learning Tree, and Project WET. These are national programs sponsored by each state through varying agencies such as Game and Fish agencies, Conservation Departments, or State Departments of Education. The findings of this study suggest that these programs are effective. School systems should utilize these resources to encourage more schoolyard nature programs.

4. The findings suggest that the participants were action-oriented teachers with a high sense of efficacy. They did what needed to be done to make their programs successful. Motivated teachers such as these are potential change agents in their schools and are encouraged by reform efforts to share in the leadership of schools (Barth, 2001; Fullan & Hargreaves, 1996; Neuman & Simmons, 2000). But there are obstacles for those teachers who are encouraging change in their schools. Barth

(2001) suggests that resistance from colleagues is one of the greatest impediments to teacher leadership. Others are a lack of time, too much responsibility, and standardized testing. The role of principal in supporting these teachers as leaders is crucial to their success (Barth, 2001; Fullan & Hargreaves, 1996). By valuing what teachers have to say and empowering teachers in the decision making process, principals can help establish a culture of shared leadership (Neuman & Simmons, 2000).

5. The participants in this study were motivated to take students outside for nature studies, but they felt frustration that more teachers were not involved. Research suggests that getting teachers to change their practices may require changes in beliefs and that collaboration may be the key (Briscoe and Peters, 1997). Administrators need to allow time for teachers to visit schools with established schoolyard programs. Visiting different schools and seeing firsthand the effects of schoolyard nature studies on students may motivate teachers to get involved. Principals can also support a culture of collaboration by providing time for teachers within a school to work together, plan together, and to visit each others' classes. By working together in a collaborative environment, teachers can share their visions, share ideas, and may empower each other to make change (Fullan & Hargreaves, 1996).

6. The findings of the study suggest that adult role models are important for instilling nature appreciation and understanding. Half of the teachers mentioned their grandparents as mentors for their interests in and feelings about nature. Schoolyard habitat programs often need adult volunteers and as grandparents are not always available, perhaps retirees in the community could help fulfill that role. A few schools around the country, including Waddell Elementary School in Lexington, Virginia, have such programs. This "Roots and Shoots" program is described in a resource book by Dirck and Molly Brown (1999): "This is a garden where young school

children, known as the Shoots and older community volunteers known as the Roots, grow vegetables, flowers and herbs together as 'garden friends'" (p.7). The intergenerational Roots and Shoots garden at Waddell won the Common Wealth Award from the Garden Club of Virginia in 1997. The web site for Roots and Shoots is http://rootsnshoots.go.to.

Summary

The quality elementary teachers in this study were highly motivated individuals and leaders in their schoolyard nature programs. They learned from their own experiences with nature and wanted to share this with children. Using hands-on experiences and inquiry approaches, they involved children in real and relevant learning on the school grounds. The teachers were life-long learners, committed to education for themselves and their students. They had received grants, awards, and attention for their programs. Most parents would be thrilled to have any one of them as a teacher for their children. Most reform efforts in science and environmental education would place these teachers as models for others.

The participants presented a positive picture of the benefits of using the school grounds for nature studies. They suggested that their students learned from the nature experiences and enjoyed the process of learning. They recalled students who used recess time to finish activities or who exclaimed with excitement, "Come, look at this!" They noted that students expressed connectedness to living things during nature study. The teachers found it fulfilling when these things happened. They expressed strong beliefs about the importance of sharing nature with children and about the constructivist methods they used on the school grounds.

Getting more teachers to participate in schoolyard nature programs will require changes in beliefs (Haney et al., 1996; Lumpe et al., 2000). Outdoor experiences for

the teachers themselves could help. If teachers become comfortable in nature and develop a basic understanding of nature, they may be more motivated to use the school grounds for nature studies. Teacher educators have opportunities to share nature experiences with teachers through preservice and inservice courses. Sharing nature with teachers may be the key to getting them to share nature with children. It may also be helpful to heed (or share with other teachers) something written by Anna Comstock back in 1911 - "What Nature Study Should Do for the Teacher":

> During many years, I have been watching teachers in our public schools in their conscientious and ceaseless work; and so far as I can foretell, the fate that awaits them finally is either nerve exhaustion or nerve atrophy. The teacher must become either a neurasthenic or a "clam."
>
> I have had conversations with hundreds of teachers in the public schools of New York State concerning the introduction of nature-study into the curriculum and most of them declared, "Oh, we have not time for it. Every moment is full now!" Their nerves were at such a tension that with one more thing to do they must fall apart. The question in my own mind during these conversations was always, how long can she stand it! I asked some of them, "Did you ever try a vigorous walk in the open air in the open country every Saturday or Sunday of your teaching year?" "Oh no!" they exclaimed in despair of making me understand. "On Sunday we must go to church or see our friends and on Saturday we must do our shopping or our sewing. We must go to the dressmaker's lest we go unclad, we must mend, and darn stockings; we need Saturday to catch up.
>
> Yes, catch up with more cares, more worries, more fatigue, but not with more growth, more strength, more vigor, and more courage for work. In my belief, there are two and only two occupations for Saturday afternoon or

forenoon for a teacher. One is to be out-of-doors and the other is to lie in bed, and the first is best. Out in this, God's beautiful world, there is everything waiting to heal lacerated nerves, to strengthen tired muscles, to please and content the soul that is torn to shreds with duty and care. To the teacher who turns to nature's healing, nature-study in the schoolroom is not a trouble; it is a sweet, fresh breath of air blown across the heat of radiators and the noisome odor of overcrowded small humanity. She who opens her eyes and her heart nature-ward even once a week finds nature-study in the schoolroom a delight and an abiding joy. What does such a one find in her schoolroom instead of the terrors of discipline, the eternal watching and eternal nagging to keep the pupils quiet and at work? She finds, first of all, companionship with her children; and second, she finds that without planning or going on a far voyage, she has found health and strength (pp. 2-3).

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Appendixes

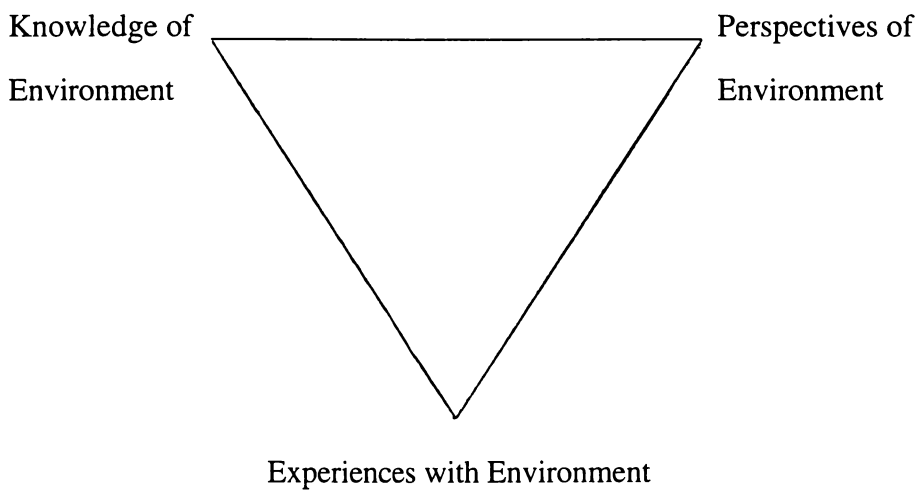
Appendix A

Theoretical Framework

Environmental Cognition

Environmental Cognition

of Elementary Teachers



Cognition and Environment

What people prefer and care about both influences and is influenced by the thought process. People's comfort, their sense of feeling at home, and their confidence in any given setting are all inseparable from their knowledge of that environment and from how readily knowable that environment is (Kaplan & Kaplan, 1982, p.x).

Appendix B

Participant Consent Form

Using the School Grounds for Nature Studies: An Exploratory Study of Elementary Teachers' Experiences

The purpose of this study is to gain understanding of the experiences of public school elementary teachers who use the school grounds for nature studies. It will be used as part of a doctoral dissertation and may be submitted to a scholarly journal for publication.

As a participant you will be asked to take part in an interview conducted at your school (at a time convenient for you) that will last no more than two hours. The interview will be audiotaped and the tapes transcribed to capture your exact words. The person who transcribes the tapes will agree to confidentiality. The tapes will be stored in a locked file in my office and erased at the end of the study. You will be given the opportunity to read and make any changes in the transcripts. Your identity will be kept completely confidential through the use of pseudonyms. The transcripts and notes will be locked in a file in my office indefinitely and may be used (by me only) in related research or in writing projects related to education. The consent forms will be stored in a locked file at a UT location for three years past the completion of the study and then destroyed.

There are no foreseeable risks involved in your participation in the project nor are there direct benefits to you. Participation will, however, provide you with the opportunity to reflect on your own experience and it will help increase general knowledge concerning the experiences of teachers regarding the use of school grounds for nature studies.

Your participation in this project is entirely voluntary and you may refuse to participate, refuse to answer any specific questions, or withdrawal at any time without penalty. You may contact me if you have further questions or concerns about the project or your participation in it. You will be provided a copy of this signed consent form.

I have read the above information and I agree to participate in this study.

Appendix C

Interview Questions
(* with probes)

1. Tell me about some of your personal experiences with nature.
    * Do you remember any early childhood experiences?
    * When did you first get interested in nature studies?
    * How do you enjoy nature now?

2. How did you learn to do nature studies with children?
    * Tell me about your experiences.
    * How do you feel about your knowledge of nature?

3. Why did you decide to start doing nature studies on the school grounds with your students?
    * How did you feel about your efforts?
    * Any new effort has challenges. How did you overcome yours?

4. Tell me about your school ground nature studies program now.
    * What kinds of things do the students do?
    * How is the program designed?
    * What excites you about your program?
    * What would you change if you could?

5. Why did you decide to design your nature studies program like this?
    * How do you think students learn from your methods?
    * How does your program design fit with your philosophy of learning?
    * Why do you think being in your program is important for students?

6. From you perspective, what are the benefits of taking students out on the school grounds for nature studies?

7. From you perspective, what are the difficulties of taking students out on the school

grounds for nature studies?

8. It may help me understand your program more if you could describe or show me the school grounds area you use for nature studies.

* What works best about the areas?
* What would you change or add if you could?

Appendix D
Personal Narrative

My earliest memories of experiences with nature go back to the summers of my childhood when I stayed with my grandparents on Bogue Sound in Morehead City, North Carolina. My brother and I played in the salt water in front of my grandparents' home, making up games where we had to dive under the water to look for shells. As I got a little older, my best friend Karen and I played in the same area and caught small minnows by kicking them up onto shore. I do not remember my parents or grandparents suggesting any of these activities (other than - "get out of the house!"), but I do recall them telling me the names of the fishes and shells. One of my earliest memories of feeling the wonder of nature was watching a thunderstorm come across Bogue Sound from the upstairs bedroom window of my grandparents' house. I also remember watching a rainstorm come toward me across that same body of water; I stood my ground and watched it approach in sheets on the salt water. The natural memories of my childhood are positive ones, and I guess I would have called myself something of a "tom-boy" in those days because I spent so much time outside.

I was not much of a nature buff after those early experiences and in fact, did not like science in high school. When I started college, I avoided science courses as long as possible and dreaded the science methods class required by my elementary education degree. I do recall that it snowed the night before the first day of that science methods class, and when we arrived the professor, Dr.Green, asked us to leave on our coats because we were going outside to a nearby wooded area to look for animal tracks. He brought science alive for me (and perhaps rekindled those early experiences) by taking our class outside often and for relevant activities. He was a biology professor, so I took several other classes with Dr. Green to satisfy my science

credits. This extraordinary teacher helped change the course of my life, as I took enough science courses after that to earn a science concentration for elementary teachers and learned to make nature study a part of my life.

As a beginning classroom teacher, I did not bring my love of nature into the classroom for several years. Even with a science concentration, I had few ideas about how to share nature with children. But one weekend, I took a Project Wild Facilitators' workshop and it really helped change my perspective about nature education. I began to take students outside for nature studies on a fairly regular basis. My integrated curriculum was most often centered around a science theme and my fourth grade students seemed to love it. They were just naturally interested in the topics and using a nature theme helped me teach all subjects to even the most challenging students. It was an exciting time for me as well, as I was able to bring together my love for teaching and my interest in and love for nature. One frustration from that time was that I could not convince my principal to allow me to start a schoolyard garden project at my school, something that was a relatively novel idea for our area. As an elementary teacher, it was not always easy to get support for new ideas.

It is encouraging today to see so many schools with schoolyard programs and support for those teachers who put forth the effort. My goal for the near future is to help a school get a garden project started.

Appendix E

Participant and School Information

Using the School Grounds for Nature Studies

Teacher --------- School	Years of Exper.	Grades Taught	Number Students In the School	% Free or Reduce Lunch	% Minority	Other
Ann Chestnut Elem.	21 years	1-4	270 in grades K-5	45%	5%	Science Resource Teacher
Betty Dogwood Elem.	28 years	1-7	551 in grades K-5	14%	10%	Retired
Bob Carson Magnet	29 years	3-6	400 in grades K-5	36%	40%	Teaches Gifted Students
Linda Roseville Elem.	15 years	2-3	725 in grades K-7	45%	8%	Started program w/ John
John Roseville Elem.	13 years	4, 6, 7th Science	725 in grades K-7	45%	8%	Did M.ED project on schoolyard use
Marilyn Cedar Elem.	6 years	K-1	350 in grades K-4	8%	1%	Year-round school
Susan Cedar Elem.	28 years	PK-3	350 in grades K-4	8%	1%	Coteaches with Marilyn
Patsy Elm Park Elem.	30 years	3-8	460 in grades K-5	34%	8%	Has active parent volunteer
Paul Cherry Hill Elem.	10 years	2, 3, 5	325 in grades K-5	99%	70%	Inner city school
Rachel Evergreen Elem.	19 years in county	K-8	400 in grades 3-5	43%	6%	Sponsors Wildlife Club

Appendix F

Examples of Outdoor Professional Development

There are certainly examples of programs that provide outdoor experiences for inservice and preservice teachers. The Chesapeake Bay Foundation (CBF) sponsors outdoor coursework for inservice elementary teachers through their Bay Schools Project. Jennifer Hulford (personal communication, June 4, 2001) works on this whole school reform effort with CBF, and she believes it is really making a difference in the teachers' attitudes about outdoor learning. CBF adopts a school for the program, works with everyone from administrators to students, and Hulford spends one day a week at the school as a year-long support person. In an effort to encourage teachers to weave the outdoors into their curriculums and instill a sense of stewardship for the Chesapeake Bay, CBF sponsors a week-long immersion course for about 15-20 teachers and at least one administrator from the school. They begin the week by doing a schoolyard investigation of the diversity (or lack of) on the school grounds. A local stream is investigated through a stream-quality survey, and then the teachers canoe a local river which is sourced by the stream. The teachers then spend three days at one of CBF's island centers where they study the biodiversity of the Bay, the island, and meet watermen who depend on the quality of the Bay for a living. Hulford states that of the 15-20 teachers who choose to participate in the immersion project, some are already outdoor enthusiasts. But she has also observed those teachers who seem closed-minded to the idea make "complete turn-arounds" to become their best leaders. Hulford states that "the teachers who go on the immersion trips are the driving force of the programs" in the schools (J.

Hulford, personal communication, June 4, 2001).

As another example, a program providing outdoor nature experiences for preservice teachers occurs each summer through the University of Tennessee. Science education professor Dr. Claudia Melear offers preservice courses which include one week on Ossabaw Island in Georgia. Though the participants are mostly preservice high school teachers, some elementary and middle grades preservice teachers also participate. Participating in inquiry type activities with science and math professors while on the island is a major focus of the courses. The students are encouraged to immerse into inquiry, i.e. to generate compelling questions and "conduct investigations that allow them to make meaning out of inquiry activities" (DiPietro, 2001, p.2). In addition, the students are required to keep a field notebook for the week and are encouraged to reflect on the week-long experiences. The immersion into inquiry strategies for this field-based program are based in part on the "Ideas that Work: Science Professional Development" website offered by the Eisenhower National Clearinghouse (2001) (http://www.enc.org/professional/ideas/science).

Vita

Tamra Willis was born in Morehead City, North Carolina on 23 July, 1957. She attended public schools in Harnett County, North Carolina and Guilford County, North Carolina where she graduated from Northwest Guilford High School in 1975. She entered the University of North Carolina at Greensboro in September, 1975, and transferred to Appalachian State University in January, 1976. She graduated from there with a Bachelor of Science in Elementary Education (Science Concentration) in December, 1979. With a teaching certificate in grades kindergarten through eighth grades, she taught elementary school for twelve years. In 1992, she was accepted as the Science Education Lead Teacher to assist in teaching science methods classes at James Madison University. While completing her Master of Science degree in Middle Grades Education from James Madison University in 1995, she worked part-time as the Science Specialist for Rockingham County Public Schools. In 1996, she entered The University of Tennessee at Knoxville to pursue her Ph.D. in Education with a concentration in science education and leadership. As a graduate teaching assistant, she taught four sections of elementary science methods classes for two semesters and worked with preservice teacher interns in the public schools. The doctoral degree was received in 2001.